

QST 

amateur radio



A KILOWATT

It is customary to think of a hundred watts as being rather high power at ultra-high frequencies, and a full kilowatt was not dreamed of a few years ago.

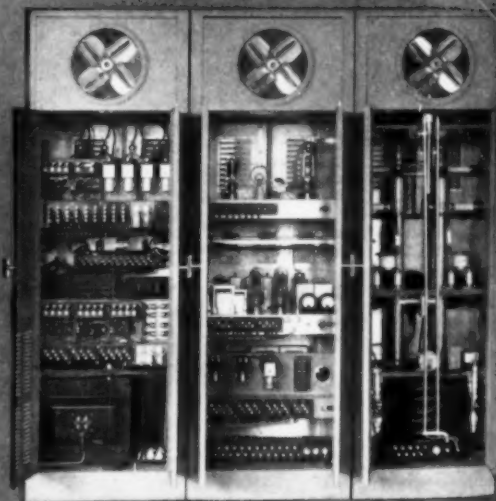
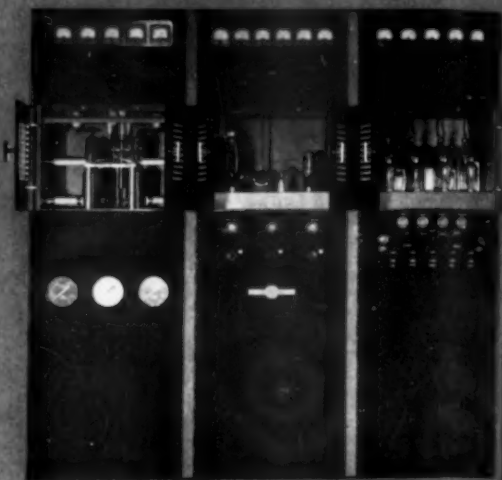
The special 201FU Transmitter illustrated is an engineering project recently completed for Farnsworth Television Incorporated of Penna. It is of real interest, not so much as a curiosity, but as an example of how a new development can be taken out of the "hay-wire," laboratory stage and be made neat, business-like and commercially usable.

The 201FU design is adapted to frequencies between 35mc. and 70mc. This particular transmitter delivers an output of 1000 watts fully modulated at 66 mc. The water-cooled tubes in the output stage are mounted in water jackets which themselves form the output transmission line tank circuit. Parallel and concentric lines are used elsewhere as tank circuits, impedance transformers and as by-passing elements.

An interesting fact is that with these components properly proportioned the entire equipment is as stable, neutralizes as completely, and functions as efficiently as if it were a conventional transmitter on much lower frequencies.

The 201FU is advertised, not as a piece of apparatus which you may want to buy, because there are few applications at present for such sets, but as an illustration of the ability of Collins Radio Company to handle difficult engineering commissions.

AT 5 METERS



COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA — NEW YORK, N. Y.: 11 WEST 42 ST.

THE EDITOR'S MILL

THE big news of the moment is about the ultra-high frequencies. As we write, the Federal Communications Commission has just issued its orders announcing the long-awaited service allocations of the frequencies from 30 to 300 Mc. Amateurs will remember the extensive hearings of June of last year which called into being our famous "Presentation for the Amateur Service." The intervening months have largely been filled with interdepartment government conferences designed to reconcile the conflicting demands for frequencies. The present result, two orders and a new text for Rule 229, makes radio history, for much of the future of our art is going to be written in the u.h.f.

What you fellows want to know, of course, is how amateur radio came out in the new deal. The news is all good. Our 56-60 Mc. (5-meter) band is reaffirmed as exclusively amateur. Our neighbor on the low-frequency side is to be the television service while, on the high-frequency side, it is government services. Then we have two new exclusive bands, from 112 to 118 Mc. (2½ meters) and from 224 to 230 Mc. (1¼ meters), our neighbors on both sides of both of these bands being government services. Thus in the new deal we have gained for ourselves two new bands of ultra-highs, each of 6 Mc. width, continuing our harmonic family as far up into the spectrum as allocation has been carried.

These new allocations are not yet effective. It will first be necessary for the F.C.C. to amend our Rule 374 and it hasn't got around to that yet. When it does, we shall probably also obtain a joint right to continue experimental work on all frequencies above 300 Mc. Meanwhile we may operate at will anywhere above 110 Mc.

The great hue and cry about u.h.f. of course has been on behalf of the impending arrival of television, still around several corners but getting closer. The new order assigns for this service seven main channels, not all contiguous, between 44 and 108 Mc., and twelve additional channels above 156 Mc., although at this stage there isn't much interest in the latter. The seven main channels, each of 6-Mc. width, are as follows, the figures being in megacycles: 44-50, 50-56, 66-72, 78-84, 84-90, 96-102, 102-108. The Commission's press release contains the interesting comment that "The investigations and determinations of the Commission justify the statement that there

does not appear to be an immediate outlook for the recognition of television service on a commercial basis. The Commission believes that the general public is entitled to this information for its own protection. The Commission will inform the public from time to time with respect to further developments in television."

There was a time when amateur radio had plenty of reason to worry about television's effect on our 56-Mc. band. It threatened to surround and squeeze it. With eventual pressure from the public, who would resent "one tooth out" of their tuning range in the shape of our band, it threatened in the long run to engulf our band. But now the fact that it is not to have a continuous assignment, that it is broken into four ranges, that our neighbors are chiefly government services—these things dissipate the fear of the old squeeze. "Five" now sits just as pretty as possible. With one exception that we'll mention below.

We have mentioned before that u.h.f. allocation proved an exceedingly arduous task. There weren't nearly so many channels as folks had imagined, and allotments were asked by every service, present and postulated, that man's mind could conceive. The end result seems to us to be about as good a job as anybody could expect. We did not receive the full width of bands to which we aspired, but neither did any other service, and the result ought to be generally satisfying to us.

So now all God's chillun's got megacycles, and the one remaining job is to equip them with radio gear and commence going places. You hams who have not yet investigated the u.h.f. are passing by one of the most fascinating fields in this grand old game. Two new bands, fellows—deserving more ham occupancy than they now enjoy!

We intimated above that there was one cloud on our 5-meter horizon. (Neat, wot?) There is. It's out-of-band operation and how we'll get-it-in-the-neck unless. It has constantly been the history of amateur radio that, following our pioneering in new territory, commercial users come in and occupy frequencies adjoining ours, and we go through a period of grief from interference complaints until we finally learn how to keep ourselves inside our new fences. That was notably true of 7, of 14 and of 28 Mc. For the last several years it hasn't been tremendously important whether we stayed between 56 and 60 or

not; there wasn't much of anybody else there. Now repeating history is bringing us neighbors in that band, people who also have the right to operate there and who are entitled to do it without QRM from us. The time has been reached in the progress of the new art when we must clean up this band. Two examples will illustrate: (1) Experimental television service is under way. Columbia Broadcast System in New York has the 50-56 channel immediately *below* our band and they've been surveying. During the past summer, listening only briefly during daylight hours, they logged scores of amateurs between 54 and 56 Mc., perfectly good W2 stations for the most part. You can imagine what it must be like on a typical winter evening. (2) Some of the government services are putting in gear to use frequencies just *above* our band for keying cir-

cuits, to control transmitters on lower frequencies. Won't some ham identify himself unfavorably in high quarters when he overrides the control signal and takes over the keying of a high-powered government transmitter!

In other words, boys and gals, the day is upon us when we must immediately clean house, take steps to insure that our signals stay between 56 and 60, and generally apply to that band the same scrupulous care that we necessarily devote to staying on-frequency in the lower bands. *QST's* technical staff is preparing practical helpful information on the subject. Let's take this to heart right now, people, and govern our 5-meter operation in such a way as to avoid complaints from our important new neighbors.

K. B. W.

Radio Amateurs in the Television Picture

Announcing a Planned Program of Technical Cooperation

By James J. Lamb*

RADIO history repeats itself. The experimental activities of licensed amateurs in radiotelephony supplied the initial impetus and acceleration for sound broadcasting in the early 1920's. Now, over 15 years later, we radio amateurs have immediately before us the same opportunity to aid the progress of modern television development and perform an important public service in traditional amateur fashion. That this should come about was inevitable. Amateur radio provides the logical experimental proving ground for new developments between their laboratory stage and their attainment of widespread practical utility. In performing this service we have not only benefited ourselves as amateurs, but we have also earned recognition for experimental contributions no less important than the appreciation amateur radio has merited for emergency and other communication activities. For a time, it appeared that those concerned with the technical and economic problems of television development would do without experimental amateur aid. According to plan, television would come out of the laboratory, pass through a period of field trials conducted by a few restricted groups, and then be presented as a fully standardized and "perfected" public service—all under strictly commercial auspices. Participation of independent amateur experimenters in the intermediate stage of this program was not con-

templated. Of course not everyone engaged in the commercial development of television thought that this would actually work out. And neither did we. Behind this lies a story.

THE AMATEUR BACKGROUND

One responsibility of A.R.R.L. headquarters is to be on the alert for technical trends which may affect amateur radio; to judge, to the best of our ability, the possibilities of new developments as aids or hindrances to the progress of amateur radio; and on the basis of this judgment to do our best, by practical action, not only to adapt developments to our own needs but also to cooperate in their evolution so that progress may be maintained.

We have actively followed this policy with regard to television since the time of those early experiments with mechanical systems some ten years ago. For television is pretty much an old story in amateur radio. This magazine devoted considerable space to experimental television systems during 1928. In fact, there were more articles on television listed in the index for that year than articles on radiotelephony, the score being 6 for television to 4 for 'phone. General Electric, in Schenectady, and the late Dr. C. Francis Jenkins, in Washington, D. C., were the principal sponsors of transmissions on the medium-high-frequency bands with pictures of 24 and 48 lines—exceedingly crude by present-day standards and even too crude to do more than demonstrate

* Technical Editor.

principles at that time. The television content of *QST* tapered off to three articles in 1929 (and telephony scored four). Two of these three articles were distinctly of a debunking nature—in the January issue, "Rotten Television," by The Old Man, whom we now know to have been our late president, Hiram Percy Maxim; and, in the March issue, "What Price Television," by M. B. Sleeper. These two stories pretty definitely wrote "finis" to the amateur's further expenditure of money and effort on experimental reception with mechanical systems.

But this did not mean that the prospect of experimental television was hopelessly ended for us. In one of the 1928 articles, "Radiovision," in the September issue, Thornton P. Dewhirst had pointed the way and outlined the basis of what has become the modern technique in television reception. He said:

"The use of the cathode-ray tube for the receiver is worthy of consideration since it opens up the possibility of real radiovision. In this tube, a stream of electrons may be moved in two directions at right angles to each other by means of either an electric field or a magnetic field. The window of the tube is covered with a fluorescent material and the electrons upon striking it cause it to glow. By means of proper values of current or voltage and frequency, the small spot of light can be made to cover completely the window. For radiovision work, the use of a material for coating the window that was not only fluorescent (emits light when exposed to certain rays) but also continued to glow for a short period after the ray has been removed would be of material assistance. This will help in causing the vision to persist and thus give the effect of greater illumination as far as this characteristic is concerned."

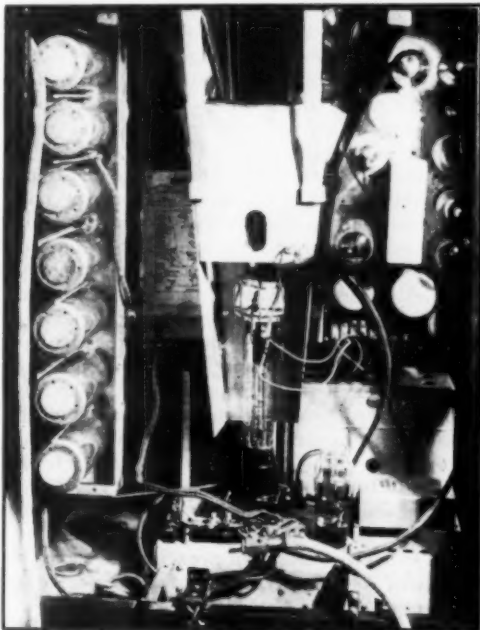
In this same article, the author also outlined general requirements for satisfactory picture reproduction which still apply—and which are not yet completely solved. Quoting his words:

"... When the elementary area used to build up our picture bears the same proportion to the whole picture that the individual particle of the (film) emulsion of the moving picture bears to the total number of particles in the exposure, and (when) some method of transmitting each of the individual parts with ease and the problem of synchronism have been completely and simply solved, radiovision will be ready for the public."

Now we must remember that in 1928 the cathode-ray tube was not the familiarly-known tool for routine amateur use that it is today. It was then a relatively rare, expensive and somewhat temperamental device restricted to the realm of the laboratory of the advanced physicist. But it soon became our conviction that television reception ultimately would employ the cathode-ray tube, and that until the c.r. tube technique was sufficiently developed, further

amateur activity in experimental television would be practically futile.

We continued to keep an eye on the ball, but could not discern anything sufficiently significant to warrant further *QST* space until 1931. But in the middle months of that year the television pot began to boil sufficiently to give off some



INSIDE A MODERN TELEVISION RECEIVER

steam and evidence of the beginning of the cathode-ray era became visible. In the early fall of 1931 Associate Editor Ross Hull and this writer made an inspection trip to several of the representative television camps to learn first-hand just how much fire there might be under the pot. The results of this survey were reported by Hull in the article, "Television—What About It?" in the Nov., 1931, issue of *QST*. The sum and substance was that the cathode-ray technique promised results, that higher definition was in sight with "perhaps 240 lines to the picture," that transmission on ultra-high frequencies above 40,000 kc. was proposed—but that television still was in the laboratory stage.

THE PRESENT SITUATION

It was not until about a year ago, in the Fall of 1936, that television had reached a stage where we became convinced that our active experimental participation would not be much longer delayed. Technique in the art had reached the state where refinement rather than new basic developments had become the ruling order. Experimental field tests with fairly high-power trans-

mitters were started. Under the auspices of the Radio Manufacturers Association, a set of proposed standards was promulgated. So we started to look for a way into the modern television picture.

But several questions of utmost importance had to be answered first. Was there reasonable assurance that transmission would, in general, conform to the proposed standards and that such changes as might be made would be in detail rather than drastically sweeping? Even though there were no transmitters using these standards operating on anything like fixed daily schedules, would there be at least sufficiently frequent transmissions suitable for experimental purposes in several centers with large amateur populations? (It was our aim then, as it is our firm purpose now, not to encourage the building of receivers by people solely interested in being entertained by television shows, but rather to present practical technical information to encourage experimenting amateurs to attack the problems of television in a constructive way.) Could we secure adequate practical technical information, with design data and constructional information on television receivers of proved performance which would be suitable for amateur experimental work? Would the operators of the experimental television transmitting stations cooperate in keeping us posted on their current activities and, possibly, their future plans? Would the necessary special cathode-ray tubes and other essential components be made available? And, finally, did a sufficient number of amateurs want *QST* articles on television?

Throughout the past year we have worked to get the answers to these questions. And we report here and now that the answer to every one of them is a resounding, "Yes!"

Taking the last question first, a decidedly positive answer was given by A.R.R.L. members returning the questionnaire sent out with membership certificates and cards. *An average of the replies for six months shows that over one-third (37%, to be exact) of the membership want articles on the theory and practice of television.*

The answer to the question of design data and constructional dope on practical television receivers was given by Marshall P. Wilder, W2KJL, who is not only a real amateur but also one of the most experienced and competent workers in the cathode-ray television field that we know of. We were fortunate to have secured the promise of his cooperation nearly a year ago, when, while he was doing independent research on television tubes, we worked out a plan for just such a series of articles as he begins in this issue. He also has been instrumental in cooperating with us to have made available to amateurs essential components, especially tubes, for construction of experimental receivers.

Promises from several manufacturers assure

diversified sources of essential television components, including several types of cathode-ray tubes and their associated components. An encouraging feature with respect to the c.r. tube situation is that the prices are to be considerably less than ordinary oscilloscope types of the same screen sizes—even though the construction of the television tubes is more expensive.

Conferences with executives of leading experimental television transmitting stations have brought promises of full cooperation in keeping us advised on times and types of transmission so that we can pass this information along to interested experimenters. We also have been informed that more frequent transmissions are contemplated after the first of the year. No changes in standards are contemplated, other than the variations in polarity of modulation and method of transmitting the brightness component described in W2KJL's article elsewhere in this issue—which the receiver, to be presented subsequently in *QST*, is designed to accommodate.

THE PROSPECT

One tangible result of all the cumulative effort that has gone into this planning is the inauguration of the series of articles on practical television reception by Marshall P. Wilder, W2KJL, in this issue. These articles will progress in logical order through the design, construction and adjustment of a cathode-ray type receiver incorporating the latest circuit developments. It will be capable of delivering a good picture. But its construction just should not be attempted by anyone less capable than the amateur who is well grounded in the fundamentals of circuit operation, who has had experience with the building and successful adjustment of fairly complicated equipment such as a multi-stage transmitter or superheterodyne receiver. He also should be familiar with the operating principles of cathode-ray tubes. In fact, he must have a cathode-ray oscilloscope available for the adjustment of the television receiver circuits before any attempt to operate the complete set is made. Experience with ultra-high-frequency apparatus and familiarity with the peculiarities of u.h.f. communication, while not so necessary, will stand him in good stead. The television receiver is not a simple thing to get going. But there are hundreds of amateurs who have the required ability and who will find it just the kind of venture to satisfy their desire for a good technical job to take on.

It must be distinctly understood that the construction of a television receiver is not to be undertaken by the non-technical "home set builder" who doesn't know a saw-tooth wave from a megacycle, no matter how alluring a kit advertisement may seem and no matter how simple a "picture diagram" may make the job look. Most of the real work (and it's head work) is in

(Continued on page 86)

Introduction to Modern Cathode-Ray Television Reception

Fundamentals of Scanning and the Make-Up of the Television Signal

By Marshall P. Wilder,* W2KJL

IT IS timely that we take a serious interest in modern television as a certain future activity in amateur radio. In this, the first of a series of technical articles on practical television, the general background will be presented.

The purpose of this series is not just to present purely theoretical television receiver design. On the contrary, straightforward practical data will be given, hope that can be used not only to give an understanding of the principles but also to make possible the construction and adjustment of a cathode-ray television receiver that works. But before tackling the working circuits it is necessary that a great deal concerning the make-up of the television signal and what goes on in television reception must be thoroughly understood, so that when the images (or beginnings of images) appear on the screen, it will be possible, by looking at the tube, to tell what adjustments need be made and where further effort should be expended to improve the quality. Only by a thorough understanding of the fundamentals, coupled with actual experience with a working television receiver, will it be possible for the amateur to participate usefully in the development of this new art.

SCANNING

No picture or scene is properly intelligible to the human eye unless it can be perceived instantaneously as a complete whole. Unfortunately, no practical electrical communication system is capable of handling more than one element of information at any instant. The inability of electrical communication systems to transmit a picture as a whole makes it necessary to dissect the picture into a large number of small elemental areas—to transmit them one by one, and to reassemble them in their appropriate positions at the receiver, in order that the observer may view the scene as a whole. If this process of dissection and reconstruction is performed a sufficient number of times per second, the eye receives the impression of a complete picture as a result of the phenomenon of "persistence of vision." This dissection of the picture into small elemental areas is known as *scanning*.

Although scanning may be performed in several ways, it is usual to scan the picture in lines from

left to right and to proceed line by line from top to bottom, in much the same way as one's eye scans in reading the pages of this magazine. This system, with a modification known as *interlacing*, has been adopted in modern practice.

Interlaced scanning requires that one line of the subject be scanned, then a line skipped, then another line scanned, and so on, until the whole scene has been covered, in alternate lines, from top to bottom. Then the scene is scanned again, getting those intervening lines that were not scanned previously. Interlaced scanning has the distinct advantage that the number of views per second presented to the eye is double the number with straight scanning; and, although the number of picture elements transmitted is no greater

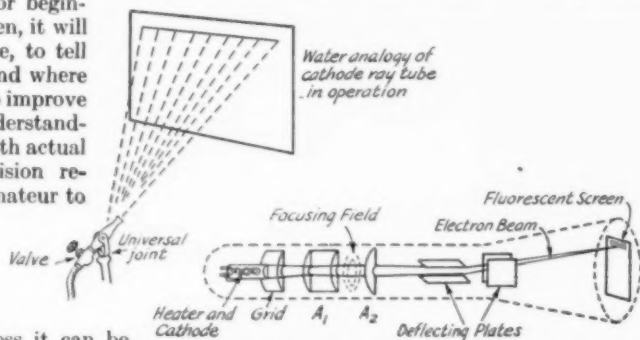


FIG. 1—ILLUSTRATING THE PICTURE-REPRODUCING ACTION OF THE CATHODE-RAY TUBE

than in straight scanning, the rate at which flicker occurs is twice as fast and above the rate at which flicker is annoying to the eye.

Television to-day is received on a cathode-ray tube. Referring to Fig. 1, we have a tube consisting of a source from which a beam of electrons is projected onto a screen, a means of deflecting this beam so it will terminate at any desired spot on the screen, and a means of controlling the number of electrons in the beam. Let us study each part separately, and thereby properly understand the action of the whole.

A simple analogy of the cathode-ray tube is difficult to find, but if we consider a fine jet of water as a stream coming from a nozzle, which can be moved backward and forward, or up and down, we can more easily understand the action

* National Union Radio Corp., 57 State St., Newark, N. J.

taking place. If, as in Fig. 1, a nozzle were set up before a screen and then moved from left to right it would draw a line of a width equal to the diameter of the stream. If we jerk this stream back to the left very many times faster than we moved it over from left to right, only a comparatively few drops of water will strike the screen during the return trip; and if we return from right to left in a slightly downward direction, the jet

of wetness; and if the valve were controlled in some proper sequence, a picture might be produced.

Of course it would not be possible to make such a piece of apparatus work as a television receiver because of the inertia of its moving parts. But, in a cathode-ray tube the stream is an inertialess electron beam. Since electrons are invisible, only the effect of their impact on the screen can be seen. This impact is visible when electrons strike certain salts, notably zinc and cadmium sulphide or their silicates. A coating of one of these materials is applied to the inside of the bulb in a thin, even layer so that the beam striking any part will show up at the point where it impinges as a more or less bright spot of light.

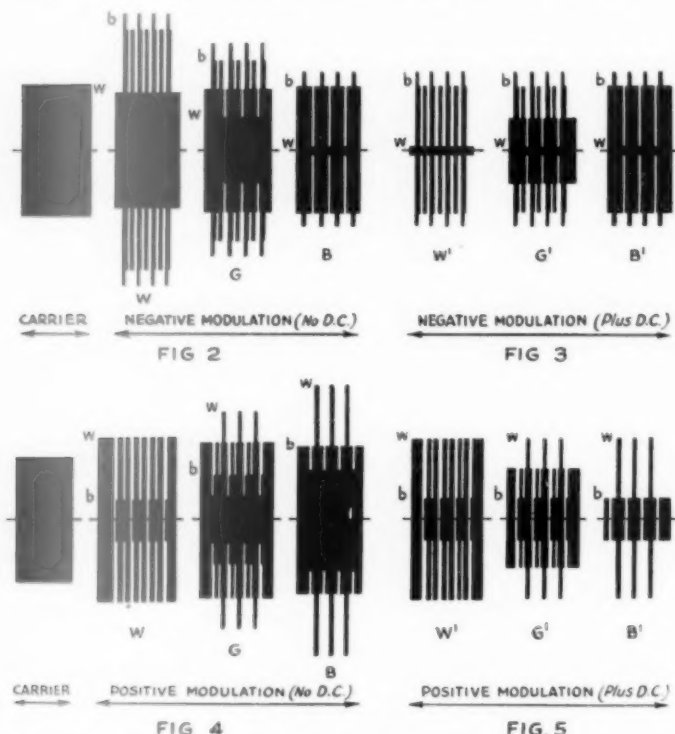
The intensity of this light can be controlled by varying the density of the electron beam. This control action is similar to that employed in an amplifying vacuum tube, the flow of electrons from the cathode being controlled or modulated by varying the voltage on a grid in familiar fashion. After this control or modulation, the emitted electrons getting past the grid are assembled by a focussing field which bundles them into a narrow beam and urges them in a forward direction between two deflecting fields, one horizontal and the other vertical. The two fields may be

either electro-static or electro-magnetic.

The strength of these crossed fields is varied in the proper sequence by local oscillators controlled by synchronizing impulses derived from the received television signal. Thus the modulated beam is made to move across the fluorescent screen horizontally in practically straight lines, and vertically from line to line, in a manner similar to that outlined in the water analogy, so that a picture of varying light intensity can be obtained.

Before considering further the actual details of how a television picture is produced in a modern cathode-ray receiver, it is well to summarize the six essential requirements which must be satisfied.

First, a beam of electrons of very small cross-section must be produced and made to strike a screen of special material which will reveal the beam's incidence at the point of contact as a spot of light.



FIGS. 2, 3, 4 AND 5—FOUR TYPES OF TELEVISION SIGNAL R.F. WAVES REPRESENTING SCANNING OF SIMPLE IMAGES

In each figure, W and W' correspond to a black vertical bar on a white background, G and G' to a white vertical bar on a gray background, B and B' to a white vertical bar on a black background. The small letters b and w on the diagrams indicate the voltage corresponding to black and white, respectively. The average amplitude and the voltage difference between b and w are intended to be the same for each condition. The synchronizing signals are the maximum parts of the wave amplitude with negative modulation, and the minimum parts with positive modulation. Without d.c. modulation, the carrier amplitude is constant and the peak amplitude varies in accordance with pedestal height. With d.c. modulation the carrier amplitude varies but the peak amplitude remains constant.

will be ready to start again from left to right and draw a second line, and so on to the bottom of the screen, where a quick jerk up to the top would set the process to begin again. To carry the analogy further, we might control the density of this stream by manipulating a valve. If we vary the amount of water projected, the result will be some sort of an image consisting of varying values

Second, the beam must be made to scan a given area in a proper sequence.

Third, the density of the beam must be capable of variation by the received impulses from the television transmitter.

Fourth, the speed of travel of the beam on the receiving tube screen must be the same as that of the scanning beam at the transmitter. This is accomplished by setting the oscillator which generates the deflecting field to run at approximately the correct rate and then applying correcting impulses at the completion of each line and at the completion of each half-frame or field. These correcting impulses are extracted from the signal received from the transmitter and are known as *synchronizing impulses*.

Fifth, *blanking impulses*, also from the transmitter, must be extracted from the received signal and applied to the beam during the retrace of each line and during the fly-back to the top of each half-frame so the beam will not have sufficient intensity to show up as light during the return trace.

Sixth, and finally, the average brightness of the picture must be transcribed from the incoming signal. Since the average brightness is of a relatively fixed nature, only varying occasionally as when the scene shifts from a dimly lighted room into a bright one, the average brightness variation must be considered as of very low frequency—or practically d.c.

There is now nearly general agreement on the technicalities for meeting these six requirements in practice—except on the method of transmitting the average brightness level and on the polarity of modulation which should be employed. With regard to transmission of information giving the average brightness or background, two methods are being used experimentally at the present time. One method employs modulation of the transmitted r.f. signal by d.c. which varies in accordance with the average brightness of the scene televised. The other method utilizes the variation in the amplitude of what is known as the *pedestal* component of the complete signal to control the average brightness of the received picture, as will be described later. The second unsettled point is whether the polarity of modulation should be negative or positive. With modulation of negative polarity, maximum amplitude of the modulated wave corresponds to black and minimum amplitude to white; while with positive

modulation, maximum amplitude of the wave corresponds to white and minimum amplitude to black. The differences between television waves of positive and negative polarity, with and without d.c. modulation, are illustrated¹ in



THE AUTHOR TESTING AN EXPERIMENTAL SUPERHETERODYNE TYPE TELEVISION RECEIVER, ONE OF THE MODELS DEVELOPED BY HIM IN PREPARATION FOR THE SERIES OF ARTICLES OF WHICH THIS IS THE FIRST

Figs. 2, 3, 4 and 5, which will be discussed later.

While these two technicalities affect the design of the television receiver, an experimental receiver employing electronic scanning can be readily adapted to receive any one of the types of transmission now in use.

The current American system employs 441 lines. These 441 lines are broken up into two half-frames of 220½ lines each. Approximately 20½ lines of each half-frame are employed for transmitting the field-frequency synchronizing impulse, as well as for blocking out the frame return trace. At the end of each line is a synchronizing impulse consisting of a pulse riding on a pedestal. The pedestal voltage is rectified and the resulting d.c. voltage determines the average brightness of the received image in accordance with that of the scene transmitted. These pedestals are used also to block the grid of the cathode ray tube to remove the return trace during the fly-back of the spot at the end of each line. To do this, the pedestal component is separated from the signal and rectified. The resulting d.c. voltage is automatically applied to bias the grid of the cathode-ray tube during each line, the video-frequency voltage being superimposed on this bias.

Meanwhile, the grid, under control of the *video*

¹ Reproduced by permission of the author and publishers from the article, "Standards in Television," by H. M. Lewis (Hazeltine Service Corp.), *Electronics*, July, 1937.

(picture element) modulation portion of the signal, determines the instantaneous brightness of the spot. In other words, the pedestal at the end of each line sets the d.c. grid bias and the video signal in between pedestals changes the intensity along each line. This is continued line by line to make up one half-frame. There are two half-frames interlaced to form one frame or picture. Thirty such completed pictures are transmitted in one second; that is, the frame or picture frequency is 30 per second, and the half-frame or field frequency is 60 per second.

In Fig. 2, a typical signal with negative modulation is represented. With the signal of Fig. 2-W a black bar on a white background would appear. The second picture, Fig. 2-G, corresponds to a white bar and a black vertical bar on a gray background, and Fig. 2-B to a white vertical bar on a black background. Figs. 3, 4 and 5 are for the same patterns with other types of modulation, which will be discussed later.

ANALYZING A TELEVISION SIGNAL

Fig. 6 represents a part of two half-frames with their line- and frame-synchronizing pulses, for a television signal wave with negative modulation. The pulses appear on the leading edge at the top of a pedestal. The width of the pedestal is equal to 1/10th of a line length. The pedestal voltage is used to bias the grid of the cathode-ray tube beyond cut-off during the retrace of the spot and to transmit the background brightness component, as previously explained. The drawing shows where the video signal stops and the synchronizing and blanking signal begins. Note that the video signal amplitude extends only part way up to the maximum amplitude of the complex signal. All signals in the region above this limit will automatically bias the grid of the picture receiving tube black. This region is therefore known as the "blacker-than-black" region, and in it all synchronizing impulses can be transmitted without appearing in the pattern of the received picture.

With negative polarity and no d.c. modulation, the average voltage of the video modulation is constant, but the height of the pedestal varies. As previously discussed, this changing pedestal amplitude conveys the average picture brightness. In Fig. 2-W the height of the pedestal is a maximum, and the picture background is white. In Fig. 2-G the pedestal is one-half the height it was in Fig. 2-W and, in this case, the background is gray; that is, half-way between black and white. In Fig. 2-B, where the pedestal height is zero, the background is black. Thus, we find our transmitted signal consisting of three major parts—

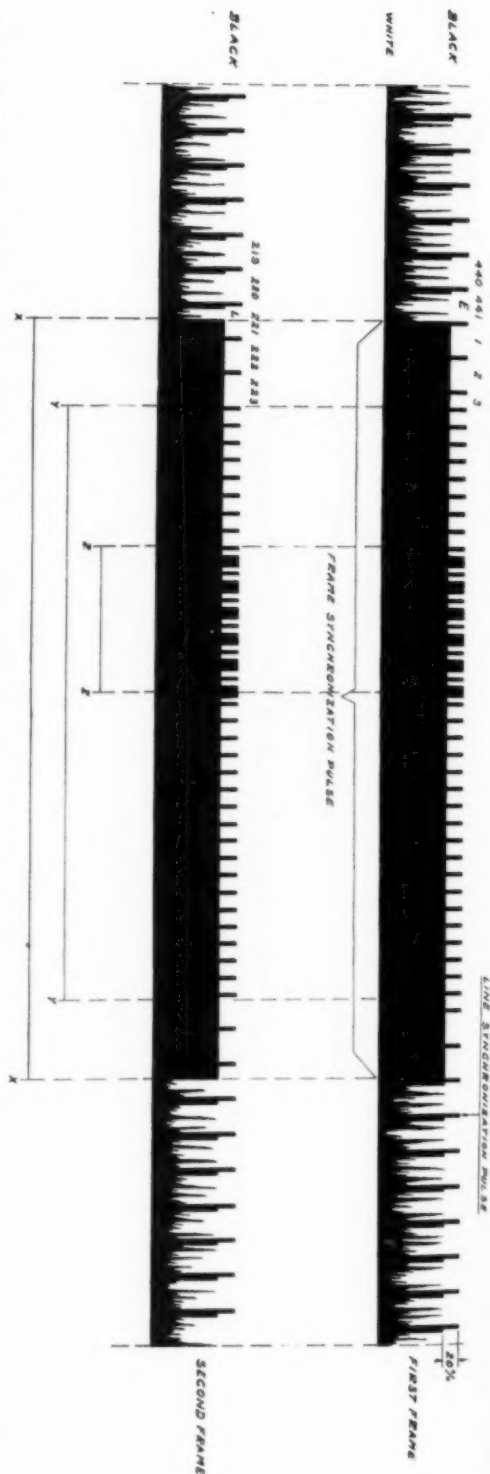


FIG. 6—CORRESPONDING SECTIONS OF TWO INTERLACED HALF-FRAMES OF A TELEVISION SIGNAL, SHOWING THE RELATION BETWEEN LINE-FREQUENCY AND FRAME-FREQUENCY SYNCHRONIZING PULSES

video signal, synchronizing pulse and pedestal.

If we return now to Fig. 6, and study the line and frame synchronizing pulses, we see the line pulse occurring in proper phase relation at the end of each line. A frame-frequency pulse occurs during a $20\frac{1}{2}$ -line interval every sixtieth of a second and consists of a group of serrations, from "X" to "X" on the diagram. Now it might appear simpler to transmit one long 60-cycle impulse for frame synchronization; but during such a long pulse, the line-frequency sweep generator would get out of synchronization. Therefore, it is necessary to transmit the line impulses during the frame impulse to keep the line-sweep generator constantly in step.

In the section called the frame or vertical synchronizing impulse region, extra impulses of a frequency which is a multiple of the line pulse frequency are inserted. These pulses will not disturb the line synchronization but will make the synchronizing impulses identical in phase and number in the region "Y-Y." Hence, integration of the frame impulse "Z-Z" can be accomplished in an RC circuit with less critical adjustment of the line- and frame-impulse separation circuit, allowing the low-frequency sweep generator to return the spot to the top of the screen ready to start the second half-frame without interrupting the line synchronization.

Interlacing of the lines of each frame is controlled by the phasing of the line-synchronizing impulse. These impulses are evenly spaced during the half-frame. They begin one-half line earlier on the first half-frame, as at "E" in Fig. 6. They begin a little later on the second half-frame, as at "L" in Fig. 6. Each time a half-frame of $220\frac{1}{2}$ lines is drawn, the line placement will shift (up or down) a line-width on the cathode-ray tube screen. During the second half-frame, for instance, as the first impulse "L" is purposely delayed a half-line, the top line will be just one line-width lower down. This second half-frame of lines will fill in between the lines drawn during the first half-frame to complete one complete frame or picture.

The system which has been described in detail is that employing negative polarity without d.c. modulation to correspond with changes in average brightness. Although this system has been principally used for experimental transmission in this country up to the present time, it must be emphasized that there is no definite assurance that it will be the one used ultimately by the broadcasting stations. As previously mentioned, at least three other combinations are possible. That represented by the wave diagrams of Fig. 5, employing positive polarity with d.c. modulation, is preferred by a considerable number of engineers, for instance.^{1,2} This is the type of signal transmitted by England's television station.

² H. M. Lewis and A. V. Loughren, "Television in Great Britain," *Electronics*, Oct., 1937.

Both systems have certain desirable characteristics for the particular service in which they are employed.

All four systems can be received on the same experimental television receiver, provided a suitable circuit is incorporated to restore the d.c. component and provision is made for reception of

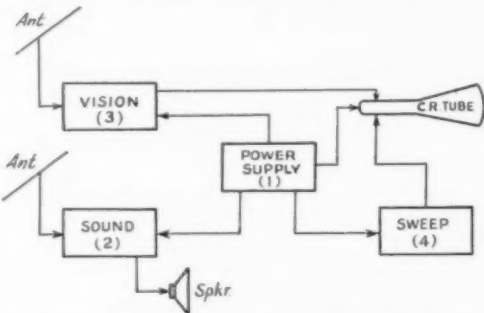


FIG. 7—BLOCK DIAGRAM OF THE UNITS OF A TELEVISION RECEIVER

signals with either positive or negative modulation. A special circuit will restore the d.c. regardless of the manner in which it is transmitted, while a simple switching arrangement can be used to change the detected signal polarity to accommodate either position or negative modulation.

It has been decided recently that a series of tests will be run by television broadcasters to determine which of these methods will be the most acceptable under actual operating conditions and will make the manufacture of television receivers the easiest. A receiver designed to be instantly adaptable to any one of the four types of signals will place the amateur in an especially effective position, since he will then be able to cooperate in the tests and furnish valuable information as to which method gives the best signal-to-noise ratio, which method causes the least difficulty in synchronization, and produces the best picture.

The receiver which will be described in subsequent issues of *QST* has been designed to have this desirable adaptability.

A WORD ABOUT STANDARDS

The tentative standards which are in use by the experimental transmitters on the air at the time of this writing, are as follows:

1. Frequency allocation, 42 megacycles to 90 megacycles, excepting the amateur 56- to 60-Mc. band; also an experimental band starting at 120 megacycles.³

(Continued on page 68)

³ New orders of the Federal Communications Commission change this allocation set-up, establishing the following channels for television: 44-50 Mc., 50-56 Mc., 66-72 Mc., 78-84 Mc., 84-90 Mc., 96-102 Mc., 102-108 Mc., and 12 additional channels above 156 Mc. This allocation does not become finally effective until Oct., 1938, however, and modification is possible before that time. See "The Editor's Mill," elsewhere in this issue.—EDITOR.

A.R.R.L. Copying Bee—December 10th

ABILITY to copy code accurately and exactly is the special pride of the earnest amateur, the mark of technique that sets him apart and makes him an amateur. This is the annual opportunity to have an interesting hour checking up on ourselves to note our progress above the mere license requirement. The winner or *as many as submit perfect copies* will receive a striking bronze medallion award from A.R.R.L. Like the previous Bees this will give hams a chance to try copying some unusual word combinations, figure groups, and simple punctuation. There may be trick words, or misspelled words and plain language groups sent in no particular sequence. It's an excellent opportunity to check up on our personal operating ability. Are we as good at the basic business of knowing our code stuff as we think we are? A feature of genuine interest to every participant: The League will return all papers (except winners) with a copy of the transmitted texts to each participant with a *confidential rating*. This report on standings will be made as soon as feasible after the closing date for mailing of copies. Transmissions will all be 60 words in length. The sending will be by tape at about 25 words per minute. It will be a test to *copy what you hear*.

The following stations, all using "automatic" equipment, have been selected in the different time zones. Care will be taken to make all messages equally difficult by different words, word order, errors, etc. It will be worse than useless to try to correct or compare messages. However we urge everybody that knows the code *at all* to take part. Send in *whatever you get*, however little that may be. Check on your own proficiency and have some good fun at the same time.

In addition to the confidential rating you will receive you have a chance to win, and *all* participants will be mentioned in the report in

QST. The schedule of transmissions for Friday night, December 10th is shown below:

The rules for taking part in the copying bee:

(1) Any amateur operator, not having access to the tape or transmission copies, and copying wholly by ear, is eligible.

(2) Mark one copy as your "best"; only this one copy shall count, but report all the above stations that you can hear to us. Keep copies other than your "best" to check yourself when we mail out the official texts to you.

(3) Print your name, call signal, and address plainly on each entry.

(4) Send in *original* copies. Re-copying messages *invariably* introduces errors and detracts from credits.

(5) Copies must be mailed bearing a postmark in the year 1937 to be counted. Mail at once or within five days to make sure.

(6) Every contestant must certify he has not been employed as a commercial or government radio, Morse or cable operator in the last year. This is strictly an amateur contest. The following exceptions, however, shall be eligible: (a) Holders of commercial licenses without experience under same. (b) Such

holders ('phone licensees or technical attendants) whose duties have not been telegraph operating within one year.

The transmitting stations will each send V's and identify themselves for ten minutes before scheduled times above. All amateurs are requested to note the frequencies listed and try to cooperate by keeping silence on these channels during copying bee transmissions, which start at the time indicated. Here's luck in the copying bee, and remember, write down *just what you hear*. If the transmission or what you can get is fragmentary, send it in just the same, so you receive credit, and we can send you the official texts for your examination.

—F. E. H.



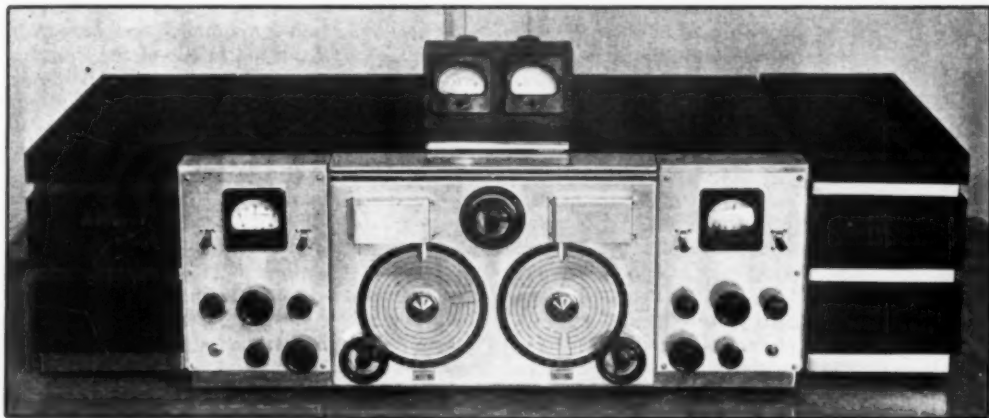
Station	Frequency	E.S.T.	C.S.T.	M.S.T.	P.S.T.
W1AW (W. Hartford).....	3825/7150 kcs.	9:15 P.M.	8:15 P.M.	7:15 P.M.	6:15 P.M.
W2AYN (New York).....	7290 kcs.	9:15 P.M.	8:15 P.M.	7:15 P.M.	6:15 P.M.
W9UZ (Chicago).....	7003 kcs.	10:15 P.M.	9:15 P.M.	8:15 P.M.	7:15 P.M.
W9BAZ (Louisville).....	3810 kcs.	10:15 P.M.	9:15 P.M.	8:15 P.M.	7:15 P.M.
W6AM (Long Beach).....	7250 kcs.	11:15 P.M.	10:15 P.M.	9:15 P.M.	8:15 P.M.

An Improved Dual-Diversity Receiver for High-Quality 'Phone Reception

By J. L. A. McLaughlin* and Karl W. Miles*

THE original single-control dual-diversity receiver,¹ employing the automatic synchronizing circuit devised by J. J. Lamb and built by the first of the authors of the present article, has been in operation for nearly two years at XEIG, the station of Dr. James M. B. Hard, at Cuernavaca, Morelos, Mexico, and has satisfactorily completed over 5000 hours of trouble-free service. It has conclusively demonstrated the practicability and the desirability of diversity reception for amateur and experimental communications work. Even with two antennas spaced but 50 feet apart, good diversity action

model is more compact, with an improved layout. The infinite-rejection i.f. system² has been incorporated, giving improved selectivity characteristics with means for the elimination of adjacent-channel interference. A simpler and more rapid coil-switching system is employed. The frequency range is from 36 megacycles to 545 kilocycles, divided into five bands. (We have included the standard broadcast band, not because any large improvement in broadcast reception is obtained by using diversity, but because we like to listen to the programs once in a while.) Electro-mechanical band spread is used so that the



THE IMPROVED DUAL-DIVERSITY RECEIVER IS DESIGNED TO GIVE BAND-SPREAD TUNING AS WELL AS GENERAL COVERAGE FROM 545 KC. TO 35 MC. IN FIVE RANGES

The matching auxiliary unit at the left is the power supply for the main receiver. That at the right contains the push-pull 6L6 output amplifier with its own power supply. The diversity meter unit on top connects by plug and cable to the voltmeter tubes in the receiver. Operating controls are identified in the text.

has been obtained, especially on the 14-Mc. band. Dr. Hard reports that many times when fading conditions and heterodyne interference become so bad as to make his other single receivers useless, the dual-diversity still brings in an intelligible signal. From the experience gained in the building of Dr. Hard's receiver, plus additional work through the past spring and summer, the new design described in this article has been completed.

Improvements have been mainly in simplifying the mechanical design and improving the i.f. amplifier, with the consequence that the new

band-spread dial can be calibrated for each of the four amateur high-frequency bands (28, 14, 7 and 3.5 Mc.). A pointer above each dial indicates the proper scale for each setting of the band-change switch.

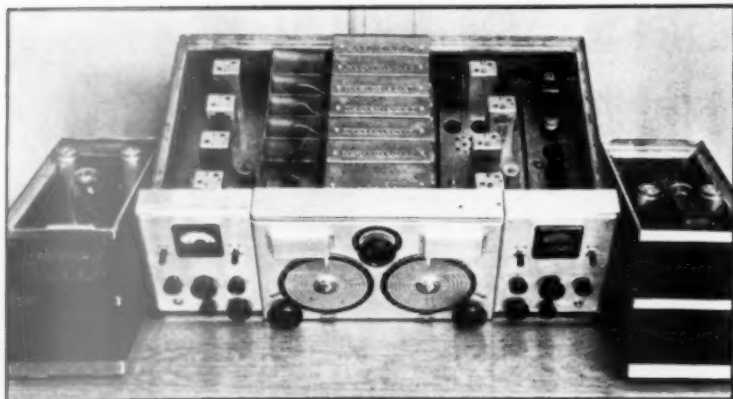
PRINCIPLES OF DIVERSITY RECEPTION

Before describing this new receiver in more detail, it might be well to digress for a moment and review briefly the principles of diversity reception and the benefits as compared to the best single-receiver methods. The principal improvement is, of course, in the reduction of fading

* The Hallcrafters, Inc., 2611 Indiana Ave., Chicago, Ill.

¹ J. J. Lamb and J. L. A. McLaughlin, "Dual-Diversity 'Phone Reception with Single-Control Tuning," *QST*, May, 1936.

² K. W. Miles and J. L. A. McLaughlin, "New I.F. Amplifier System with Infinite Off-Frequency Rejection," *QST*, Nov., 1937.



THE TOP VIEW OF THE COMPLETE RECEIVER WITH COVERS REMOVED SHOWS THE SEPARATE I.F. ASSEMBLIES EITHER SIDE OF THE HIGH-FREQUENCY CIRCUITS IN THE CENTER

The coil assemblies for the h.f. stages are separately shielded.

effects. Fading is the result of several waves from the same transmitter arriving at the receiver over different paths. The signal delivered at the output of the receiver is the resultant of these several waves, which arrive over paths differing in direction and length, and which are of varying amplitude and phase. The most vicious fading at high frequencies is experienced when two or more of these waves are of approximately equal amplitude. The phase angle between the waves arriving over varying paths is continuously rotating and when the amplitude is the same in two waves and the signs are opposite, the resultant is zero or "no signal." This is what may take place when a good signal suddenly takes a dive below the noise level. For a pretty good picture of just what diversity offers, let us refer to the original article in May 1936 *QST*, particularly the following:

"The lead to a method of solution (of fading) lies in the happy fact that a signal does not fade identically in two antenna locations at the same instant, even when the two antennas are spaced only a relatively small distance apart, or when they are near to each other and in different planes of polarization. In other words, there is considerable diversification in the fading of a radio signal, not only as regards space but also as regards polarization. Diversity reception is the method which takes advantage of this vulnerable spot in fading's armor.

"The basic idea is to pick up the signal waves on two or more different antenna systems and then combine the signals in a common receiver circuit. While it might seem possible to accomplish the result by coupling the several antennas to a single receiver in such fashion that the signal amplitudes are added at r.f., this simple method is impracticable. An input coupling arrangement for several antennas might be phased to give addition of the r.f. amplitudes under constant signal phase conditions; but constant r.f. phase

conditions just do not exist. Variation in phase conditions is inevitable in the phenomenon of fading. The combining operation must take place in some part of the receiver circuit where unpredictable radio-frequency phase differences are no longer of consequence. It is only in the output of the final detector, where we have the rectified envelope of the signal to work with, that the combining operation becomes practicable."

The latest commercial space-diversity receiving system uses three antennas spaced about

1000 feet apart and generally located at the corners of either a right-angle or an isosceles triangle. Three separate and individually tuned receivers are used, each connected to one of the three antennas. Detector outputs of the three receivers are tied together across a common load. Combining the signals after rectification results in audio output which will be the average of the several signals. By virtue of common a.v.c., the receiver with greater signal input takes control of the gain of all three receivers and supplies practically the total output. The gain of the other receivers, at that instant of time, is so reduced that the noise they would otherwise contribute is made negligible. This gives a signal-to-noise ratio approaching that of the particular receiver in control at this instant and results in a considerably higher average signal-to-noise ratio than can be obtained with the single-receiver method of reception.

While the type of system with separate tuning of each receiver is ideal for commercial communication work, where a diversity unit is used to receive from only one or but a few transmitting stations and on one frequency for hours at a time, it is, nevertheless, hardly adaptable for use in amateur communication work. As was pointed out in the previous *QST* article,¹ separate tuning still left the operation complicated and too time-consuming for practical amateur work. (Just tune in a signal on the crowded 4-Mc. 'phone band some busy evening on one receiver, and then try to tune a second receiver to the same signal—and find out how much time it takes. And as for simultaneously tuning both receivers across the band looking for the answer to a CQ —!)

The single-control dual-diversity system differs from the commercial diversity system in that instead of using separately tuned receivers with individual high-frequency oscillators, a common

oscillator is used which feeds the first detectors of two receivers. The tuning condensers of the r.f. circuits of the two receivers and the common oscillator are ganged together. Besides the virtue of simpler tuning, the dual-diversity method with its common oscillator is, we believe, an improvement over the commercial practice of using separate oscillators with each receiver. Ignoring the tuning complications of operating two or more receivers on the same signal, the common oscillator system eliminates the need of the expensive precautions found necessary in the commercial type to prevent the high-frequency heterodyne oscillator of one receiver from feeding into one of the other antennas or input circuits. With separate oscillators it is, of course, practically impossible to obtain perfect synchronism for any appreciable length of time. Hence, in the commercial system, it has been found necessary to keep stray oscillator leakage from one receiver as much as 140 db below the signal level in the input circuits of the other receivers.²

CIRCUIT ARRANGEMENT

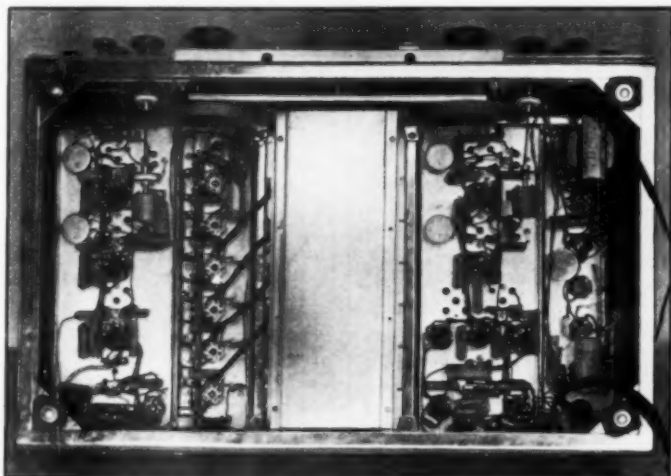
The single-control dual-diversity receiving system consists of two complete r.f., i.f. and second-detector circuits with a common r.f. heterodyne oscillator, common a.v.c. and one audio amplifier. Two stages of r.f. are used ahead of the mixer stage of each channel. The five coils for each stage, together with the necessary trimmer and padding condensers, are housed in a separate shielded box. Referring to the top view, the first box toward the back of the set is the first r.f. stage for receiver "A." The second box is the first r.f. stage for receiver "B." The third box is the second r.f. stage for receiver "A," the fourth box is the second r.f. stage for receiver "B," and so on to the last box (larger than the others) which contains the coil assembly of the common r.f. heterodyne oscillator. A seven-gang variable condenser with double rotors (one for band-set dial the other for band-spread) is mounted below the coil boxes in a separate shielded compartment.

Each box contains the necessary switches to shift from one band to another, a long shaft through all the boxes shifting the switches together in proper sequence.

A shield will be noted between the tubes in the r.f. section. This is employed not so much to keep down coupling between tubes of the same receiver

circuit but rather to reduce cross coupling between tubes of the two receiver circuits, "A" and "B." Fairly good isolation between the two circuits must be maintained to prevent cross-talk from impairing good diversity action. In the present set-up the isolation between circuits "A" and "B" is approximately 40 db, which proves to be sufficient, and most of the residual coupling is between the 6L7 mixers in the injection circuit.

The i.f. amplifier for each channel uses three stages with iron-core transformers tuned to 465 kc. in the infinite rejection system described in

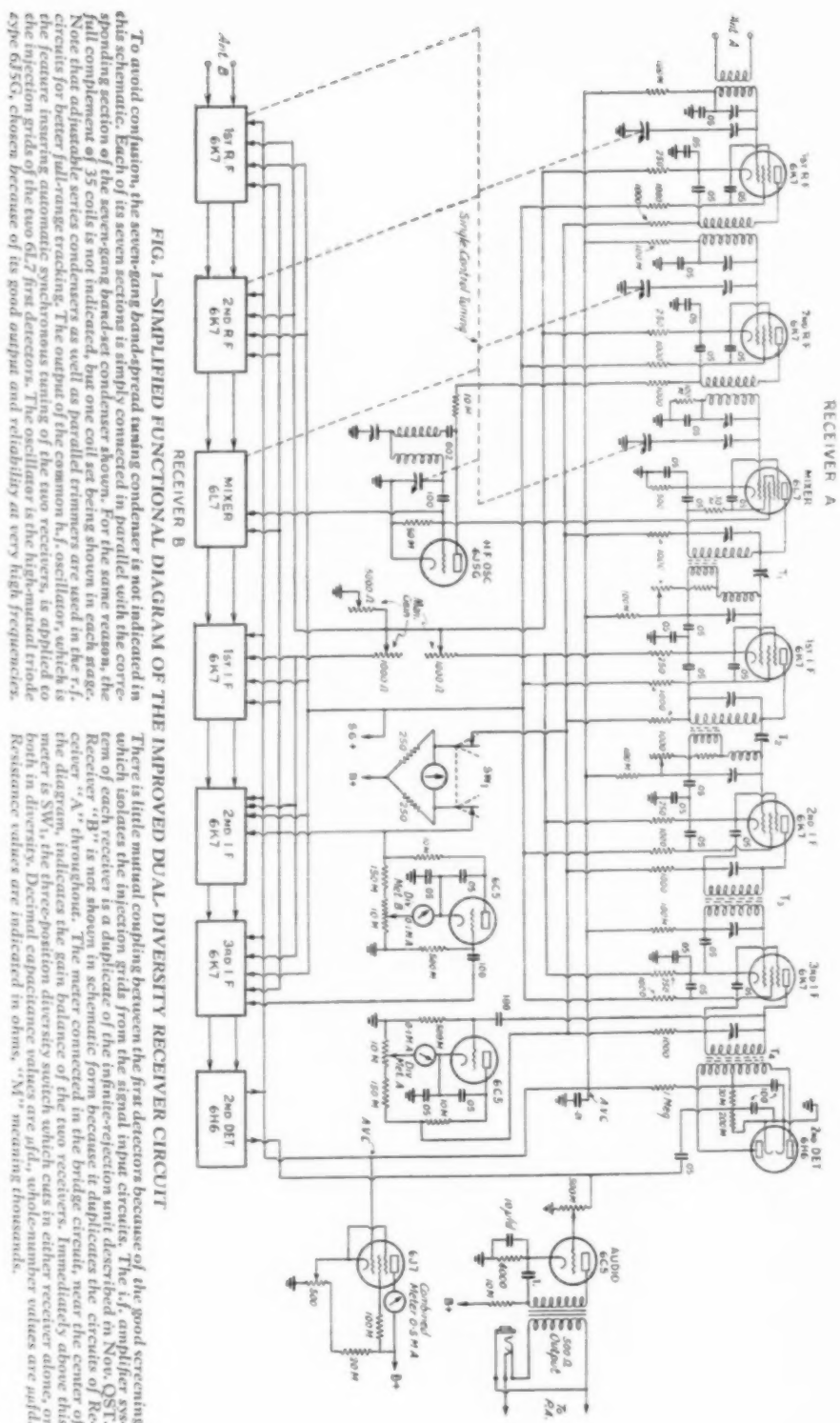


ORDERLY WIRING AND PLACEMENT OF COMPONENTS PREVAILS BELOW DECK

November *QST*.² This is a radical departure from previous systems in that two of the i.f. coupling circuits of each receiver are in themselves infinitely selective in rejecting off-frequency interference at a particular frequency. As used in this receiver, the first rejector in circuit "A" is fixed at 5 kc. off-resonance on the high-frequency side and the second (variable) rejector is normally set at minus 5 kc. In circuit "B" the first rejector is fixed at 5 kc. off-resonance on the low-frequency side and the second (variable) rejector is normally at plus 5 kc. The variable rejectors can be swung 5 kc. either side of resonance for the purpose of wiping out a particular interfering signal.

It has been found in practice that when the rejectors are set close to the resonance frequency (within 1 kc., for instance), the power-factor corrector resistor (R_1 of Fig. 2 in the Nov. *QST* article) becomes quite critical for infinite rejection; so a variable 1000-ohm resistor in series with the proper fixed resistor is used in each circuit as a vernier to permit close adjustment for maximum rejection under such conditions.

² J. B. Moore, "Recent Developments in Diversity Receiving Equipment," *R.C.A. Review*, July, 1937.



CONSTRUCTIONAL FEATURES

The mechanical construction is quite unique. A conventional chassis is not used. A heavy steel frame of U-shaped angle construction is the main support of the various units. This frame is mounted between two larger frames of similar construction which form the sides of the cabinet. Another U-shaped angle frame with reinforced corners is bolted to the bottom. The cover, instead of being just a flat piece of sheet metal, is a solid box-shaped unit. The front panel follows the same general design of reinforced construction. The two side pieces are box-shaped and give good support for the main center panel. The whole makes for a very rigid assembly, strictly functional in design and pleasing in appearance.

The front panels are aluminum finished with "alumilite." (A heavy aluminum oxide is deposited on the surface of the aluminum by electrolysis, which gives it a tough permanent finish.) The main dials are similarly treated. To insure good frequency stability, excessive heat is kept out of the receiver by building the power supply and power audio amplifier in separate boxes of similar construction to that of the receiver. These units are placed at the sides of the main receiver and conform to give unified appearance.

A few words about the mechanics of the tuning mechanism. Both rotors of the 7-gang variable condenser are fitted with split worm-gear drives. Both of the large 6-inch dials are direct reading in frequency, a separate scale being used for each range. This is a great help in tuning, in setting and re-setting the different frequency ranges without reference to calibration charts or tables. The band-set dial calibrations hold true providing the band-spread dial is set to zero. The band-spread dial calibrations for each of the ham bands are effective when the band-set dial is set to the high-frequency end of the particular ham band being used. This dial is directly connected to the worm shaft and requires 35 complete revolutions for one complete span of its associated main dial. The outer rim of each of the main dials carries a scale having 35 equal divisions. One revolution of the micrometer dial (behind the panel) moves the main dial one division. Since the micrometer dial on the worm shaft is calibrated with 100 divisions, the dial setting can be read with an accuracy of one part in 3500. This auxiliary micrometer calibration is for use when greater calibration accuracy is needed than that supplied by the direct frequency calibrations on the particular scale being used. This micrometer calibration arrangement allows a scale length equivalent to approximately 35 feet. The scheme is not entirely original with us, as it has been used for some time by several of the well-known laboratory instrument manufacturers for applications in which precise calibration is highly desirable.

(Continued on page 76)

Low-Power Contest Results

THE August Low-Power Contest (for stations using 25 watts or less) turned out in some respects to be a miniature Field Day. Some 60 per cent of the 137 operators participating did so from portable stations "in the field." 54 operators manned 46 stations at home locations, 83 operators manned 26 field stations. Comments from participants bring out the fact that low power gets results. The fellows to whom low power was a new experience, marveled at the results obtained even though the meters were not hanging over onto the pins. The regular low power men justly demand, "Chalk up one for our side!"

Scoring was simplified as much as possible. Each contact counted one point. An extra credit of 10 points could be claimed for sending a message to A.R.R.L. HQ's reporting transmitter tube line-up and power supply equipment. The sum of claimed points were multiplied by 1.5, if either the receiver or transmitter was self-powered, and by 2, if both transmitter and receiver were supplied from a source independent of the public mains; 25 watts input to the final stage of the transmitter could not be exceeded in any case. But one transmitter and one receiver were permitted to be used at any one time at any station.

The leader in this first exclusively low power contest was W2DKJ-2, operated in the tower at 40 Wall Street, New York City, by Arthur H. Lynch, W2DKJ, A. J. Haynes, W2JHV, and P. A. Denonn, W2IGK. These men worked 107 different stations for a score of 234. And now for the surprise—all work was with about 8 watts input on 56-Mc.! W2DKJ has always been an enthusiastic participant in field day operations, making a new record for 56-Mc. F.D. work in the June affair. The experience gained in previous doings certainly paid dividends! FB, DKJ, JHV and IGK!!

The three-man crew of the Central Colorado Radio Association's entry, W9PWU-9, came in second with 172 points. . . . 76 QSO's, self-power being used throughout. Operation was from Flagstaff Mountain, Colo., 'phone and c.w. being used on 1.75, 14 and 56 Mc. Power was obtained from a gas driven generator.

Third in line was W8IFD-S at Camp Aharah (Y.M.C.A. camp), about 140 miles north of Kalamazoo, Mich. The three operators here (W8OBP, W8QQE and W8IFD) emerged from the battle with 160 points from 70 QSO's. 3.5, 7- and 14-Mc. c.w. and 3.9-Mc. 'phone were used. Storage battery and "B" batteries for the receiver, storage battery and genemotor for the transmitters, constituted the power source.

So close behind W8IFD-S that you can hardly notice the difference is VE3GT . . . 159 points

(Continued on page 80)

• What the League Is Doing •

League Activities, Washington Notes, Board Actions—For Your Information

Conferences Preparations for the American regional conference at Habana and for the world conference at Cairo are substantially complete at this writing. In fact, by the time these words appear in print the Habana conference will be about over. Our aims at the latter conference are to see all the amateur bands confirmed as exclusively amateur within the American region, to prevent the overrunning of the 7-Mc. band by 'phone, to obtain region-wide authority for the handling of third-party friendly messages by amateurs, and to effect amateur participation in the Pan-American Radio Technical Union. We should have some preliminary reports on the outcome in next *QST*.

At Cairo the United States will stand for the preservation of all of our bands. She believes that the 1.7- and 3.5-Mc. bands should continue in their present status, shared with fixed and mobile in the international table, so that their whole widths may be available on this side of the water as now, and so that European nations may continue to give their amateurs as much of these bands as they need. Rejecting both the proposals to widen and to narrow our 7-Mc. band, the U. S. will support our present width. The 14-Mc. band will be similarly defended against the proposals to reduce it, and the 28- and 56-Mc. bands sponsored as exclusively amateur. Our government wants each nation to continue free to set the power of amateur stations, opposing the Japanese proposal to cut us to 50 watts in the antenna. Similarly favorable decisions have been reached on numerous minor points which are not of great interest at this stage.

Even the ultra-high frequencies will come in for some consideration at these international conferences. Further information on developments in this field will be found in this month's editorial.

R.M.A. The A.R.R.L. Board at its last meeting petitioned the Radio Manufacturers Association to establish higher standards in the design of midget broadcast receivers to preclude the pick-up of interference from other services operating in accordance with good engineering practices. The R.M.A. seems to have pitched right into the subject and have been to see us to obtain data on the exact nature of the interference and on the damages suffered by amateur radio as a result thereof. Our technical editor has given them extensive data on the

principal types of interference experienced and on the technical deficiencies of the affected receivers which are responsible for the trouble. There is room to hope for some real progress in this matter, certainly for a much clearer realization of the deficiencies of these cheap sets.

New C.S.O. On October 1st Colonel Joseph O. Mauborgne became Chief Signal Officer of the Army with the rank of Major General, succeeding Major General James B. Allison, who has retired.

Because the Signal Corps deals with many forms of communication, it is interesting to know that General Mauborgne is primarily a radio man. In 1912, as a lieutenant at Fort Riley, Kansas, he installed a quenched-spark radio set of his own devising in an airplane and provided the first air-to-ground radio communication in history, and two years later accomplished two-way radio communication between plane and ground for the first time. In his long career he has of course had many important assignments. His last previous one was as director of the aircraft laboratory at Wright Field, Dayton, before which he was Signal Officer at the Presidio of San Francisco. During the 1927 Washington conference General Mauborgne, then a lieutenant-colonel, was a warm defender of amateur radio and worked actively in our behalf, as was reported in *QST* at the time. In fact it is interesting to note the recent promotions of the two service men who were most instrumental in our aid at that time: Lieutenant-Commander T. A. M. Craven, U.S.N., retired, has recently been appointed an F.C.C. commissioner; while General Mauborgne now heads his branch. Indicative of the latter's continued interest in us is the following letter he recently wrote to the Editor:

Dear Warner:

I was delighted to receive your letter of October 6, 1937, extending the congratulations of yourself and the American Radio Relay League upon my appointment as Chief Signal Officer. May I extend my most sincere thanks to both yourself and the League for your congratulation and good wishes?

Having started as a "ham" many, many years ago, it is but natural that my sympathies for the American radio amateur should always be of the warmest nature, as I believe you personally have witnessed during my many contacts with you in connection with the work of radio conferences in the past. You may be assured that I shall continue to have a very strong interest in the operations of the American Radio Relay League. 73.

(Continued on page 43)

Applying Inverse Feedback to the Universal Speech Amplifier

Modifications to Improve Frequency Response and Increase Power Output

By George Grammer*

MOST 'phone operators are distinctly "quality-conscious," to judge by the important place the word occupies in most air conversations. Yet few seem to have taken advantage of one of the easiest methods of improving speech-equipment frequency response and reducing distortion, the two most important ingredients of "quality." Although the advantages to be gained by the use of inverse feedback have been dwelt upon several times in *QST*,¹ it may be that any sort of feedback is an anathema to builders of speech equipment and consequently

is no dodging the fact that practically every amateur who takes pride in his equipment wants that extra something which makes for good speech quality, even though the additional trouble and expense may not be justified from the purely utilitarian standpoint. Therefore, any reasonably simple and inexpensive means of increasing frequency response should be of interest.

Simply to see what could be done by such methods, we decided to "operate" on the speech amplifier described in October *QST*.² As originally built, this unit incorporated components

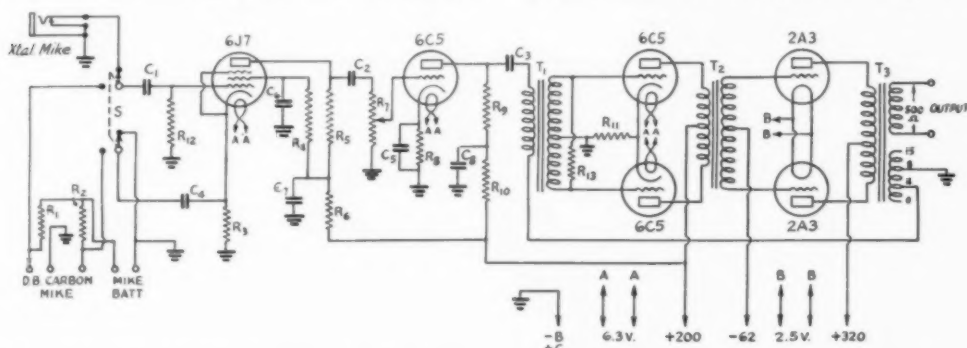


FIG. 1—REVISED CIRCUIT DIAGRAM OF THE UNIVERSAL SPEECH AMPLIFIER, INCLUDING INVERSE FEEDBACK

Constants are the same as given in Fig. 1, page 16, November, 1937, *QST*, with the following exceptions: C_4 , 15- μ fd., 25-volt electrolytic; C_6 , 4- μ fd. electrolytic, 200-volt; R_{13} , 250,000 ohms, $\frac{1}{2}$ -watt.

is left severely alone by those who stand to gain a good deal from its use. Actually, it's not such a formidable thing to apply.

It is well known that the transmission of intelligible speech does not impose very rigorous demands on the frequency characteristic of the speech system. For all practical purposes, a frequency characteristic fairly uniform between about 200 and 3000 cycles is adequate for good reproduction of speech; the addition of lower and higher frequencies does not add materially to the intelligibility. For amateur communication, more than good intelligibility is not required, but there

and circuit constants designed for speech reproduction, with cut-offs near 100 and 5000 cycles. The transformer-coupled stages were naturally suspected of introducing most of the frequency discrimination at the low and high ends; however, the constants of the first two stages, the 6J7 and 6C5, had been selected for 100-cycle cut-off, so the first step was actually to measure the performance of these two stages from the frequency standpoint. To do this the first transformer, T_1 was disconnected from the 6C5 plate circuit and an oscilloscope connected through C_3 . With variable-frequency constant-amplitude input to the 6J7 grid, the output of the two stages was down perceptibly at 100 cycles, although perfectly flat from about 200 cycles up to 15,000, the limit of the audio signal generator range.

* Assistant Technical Editor.

¹ "Some Practical Inverse Feedback Circuits for Audio Power Amplifiers," *QST*, January, 1937; Carter, "Inverse Feedback Applied to the Speech Amplifier of the Amateur 'Phone Transmitter," *QST*, April, 1937; "Note on Reduction of Distortion and Noise with Inverse Feedback," *QST*, July, 1937.

² "A 10-Watt Speech Amplifier with Voltage-Regulated Plate Supply," *QST*, November, 1937.

Now it is generally possible to use feedback over two stages without running into oscillation difficulties but somewhat dangerous over three, especially when some of the stages are transformer-coupled, because phase shifts in the transformers can cause oscillation at the high or low ends. Therefore we had decided to confine the

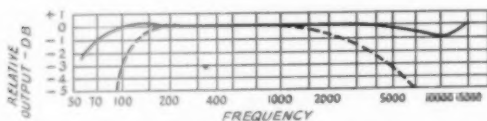


FIG. 2—FREQUENCY RESPONSE CURVES WITH AND WITHOUT INVERSE FEEDBACK

Solid line, with negative feedback applied; dotted line, without feedback. Reference frequency, 400 cycles. Output level approximately 9 watts.

feedback to the last two stages only, thereby including all the transformers. Negative feedback, however, cannot correct for frequency discrimination in stages preceding those treated unless special frequency-correcting measures are taken in the feedback circuit itself. We felt that it would be simpler to straighten out the front end insofar as possible, and thus avoid the special equipment needed for accurate frequency correction in the feedback circuit.

The low end of a resistance-coupled amplifier can be boosted readily by the use of sufficiently large by-pass and coupling condensers. Trial of several condenser values at various points resulted in flattening out these two stages to the extent that the amplification was uniform from 70 cycles up to 15,000, the low-frequency drop becoming perceptible at about 50 cycles. The new condenser values are given in Fig. 1, the resistors remaining unchanged. The changes, in brief, consisted of making C_4 a 15- μ fd. instead of 5 (a 10- μ fd. electrolytic shunted across the original 5- μ fd. unit), and C a 4- μ fd. electrolytic instead of the 0.1- μ fd. paper originally specified. Increasing other condenser values made no noticeable difference in performance, hence these were left alone. A recheck of the frequency characteristic of the entire amplifier after the changes were made showed no difference in the final output, thus confirming the original suspicion that most of the discrimination was in the last two stages.

ADDING NEGATIVE FEEDBACK

Several methods are available for applying feedback. Many of these use resistance-capacity combinations, which, however, are not always suitable in the case of transformer-coupled amplifiers. In this case we wanted to introduce the

feedback in the primary of T_1 and thus compensate for all the transformers in the speech amplifier. Introduction of feedback in the secondary circuit would not correct for frequency discrimination in the primary, and besides would have been difficult to apply to a push-pull transformer without separate secondary windings or without special taps.

The first scheme tried used a resistance-capacity network from the plate of one 2A3 to the primary of T_1 , the feedback voltage being developed across a resistor of a few thousand ohms connected between the lower end of the primary and ground. This was fairly satisfactory at the high-frequency end, but did not give any particular improvement at the low, although the values of R and C were varied over quite a wide range. This was probably the result of different orders of phase shifts in the transformer and feedback network. A better arrangement—the one finally adopted—used transformer coupling in the feedback circuit. The means for introducing feedback were right at hand, since the output transformer, T_3 , was provided with a speaker voice-coil winding. Taking some of the voltage

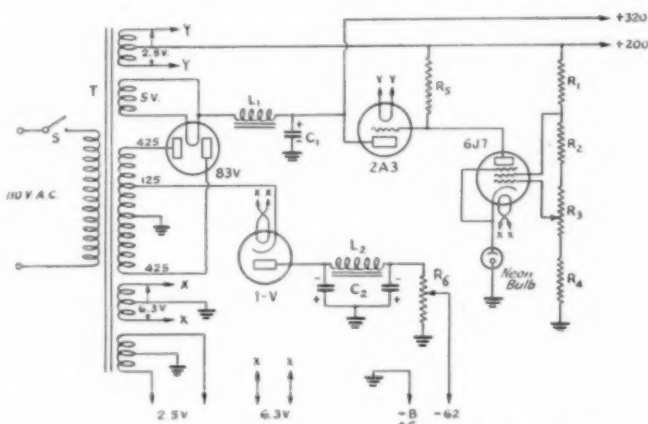


FIG. 3—REVISED POWER SUPPLY DIAGRAM, WITH BIAS SUPPLY INCLUDED

Constants are the same as given in Fig. 2, page 17, November, 1937, QST, with the following exceptions: R_5 , 12,000-ohm semi-variable resistor (25-watt slider type); L_2 , midjet filter choke; C_2 , double 8- μ fd. 250-volt electrolytic. L_1 and C_1 are the same as L and C in November QST, with the two sections of C_1 in parallel.

developed across this winding and inserting it in series with the primary of T_1 gave much better performance and required not a single extra component. The method of connection is shown in Fig. 1. The voice-coil winding is tapped for 4, 8 and 15 ohms; in our case proper phasing and about the right feedback voltage were secured when the 8-ohm tap was grounded and the 4-ohm tap connected in series with the primary of T_1 . Reversing the voice-coil winding connections

(Continued on page 84)

A Rotary Spider-Web Loop Antenna With Reflector

An Inexpensive Horizontal Array of Good Directivity

By Charles W. Lugar,* W8MRR

IT has not only been the desire of the writer to find a solution for the problem of present congestion of our allotted amateur bands but also find a means for hearing and working DX. Quite naturally the above sounds like a large order to undertake; but, nevertheless, it is a task which is growing in importance by virtue of the fact that our ranks continue to increase.

Briefly, let us state that more power does not solve the problem. Granted, our percentage of stations worked may increase in the face of QRM; but it is also granted that, as first one of us and then many add watts to the final, the conclusion is bedlam! The situation is certainly not improved by such a trend.

Where, then, can we start to find a solution? At least one trail seems worth following; namely, the antenna. Many are on the way and the results achieved to date are well worth additional study and experimentation. Let's pause a moment and size up the antenna situation from a general viewpoint. We can divide the various systems into two classes, generally speaking, from the standpoint of mechanical construction; those capable of mechanical change of their orientation at the will of the operator, and those maintained in a fixed position. Each class has its advantages and disadvantages over the other—gain, size, ease of construction, space required, labor, cost, frequency flexibility. All these factors should be given consideration if we are to design an antenna that can be utilized by the majority and that, consequently, will be a step forward in the solution of our problem. We

may not all have a forty-acre field or even a complete kit of tools, not to mention the size of the proverbial pocket book. This latter sometimes supplies a certain amount of braking action to our enthusiasm.

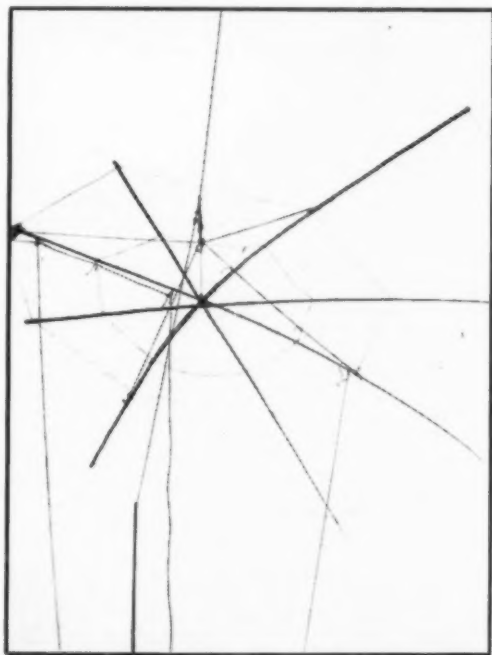
In view of all the above, just where do we get off? It has been our experience not to get excited over working in any one particular direction. Rather, we like to communicate with the boys whether they be east, west, north, or south. Likewise, when we are carrying on a QSO to the east,

for instance, we do not like competition from other directions. Therefore, in answering the above we decided that some form of rotary antenna with the greatest possible pick-up and transmission in one direction was desired, plus the fact that ease of construction and low cost were to be given every consideration.

All our thoughts and schemes seemed to be rather complicated affairs; lattice-work masts, electric rotating drive mechanisms, thrust bearings, remote control, and various designs of complicated arrays. All of these ideas were very fine and possibly of value—but not altogether necessary. At any rate, they can be added at any time if desired. But this was

not even the start; how about the antenna itself? We noticed that others had obtained a gain in one direction by twisting a half-wave dipole in the form of a circle,¹ thereby getting with one stone the two birds, small space and good directivity. Then the idea took the form of a new question. How about adding a reflector to this

¹ J. L. Reinartz, "Half-Wave Loop Antennas," *QST*, Oct., 1937.



THE WEB SUPPORTED BY HALYARDS BETWEEN THE REGULAR ANTENNA POLES AT W8MRR

* 302 Ferndale Drive, R.F.D. No. 4, Youngstown, Ohio.



A RIGID TOWER EQUIPPED WITH A ROTATING MECHANISM SUPPORTS THE WEB ASSEMBLY AT W8MJM

design? From there we were off in a cloud of dust. (Although it happened to be wet at the time!) Copper tubing was a little heavy, as we had decided to utilize a couple of poles already in position. We would make a framework of bamboo and hoist it into place, as we would any other antenna, between said poles. Ordinary wire, No. 14 or No. 12 copper, seemed logical from this angle. However, we realized that a circle could not be formed with such material; therefore, the octagonal shape was decided on, since we could get this with five 20-foot bamboo or cane fishing poles.

After looking around we located the poles and proceeded to bring five of them home. They were laid out in the backyard and lashed together, as shown schematically in the accompanying diagram of Fig. 1. Next, a piece of string was made fast to the center or pole intersection and a length of 5 feet 8 inches was measured off on the string. Using this as a radius, each pole was marked this distance from the center. Next a length of 11 feet 6 inches was measured off and this was also marked off near each end of the double cross pole (A-A') and the small ends of the other three center poles (B'-C'-D'). This distance finally became 11 feet 2 inches after some work with a signal strength meter.

Ordinary porcelain cleats or insulators were

made fast to the poles, as suggested by the detail in Fig. 1, and the radiator and reflector wires were fastened to the other ends of the cleats. Airplane-type strain insulators, large size, can also be used here. A few feet of sash cord served for making a bridle and the entire array was secured to rope halyards from each of the two masts. It was then a simple matter to hoist it in place approximately one-half wave off ground. It is interesting to note that we did the hoisting in less than two hours after assembling the necessary materials—and most of them came from the junk box, at that.

By adjustment of the bridle ropes any tilt angle desired can be obtained. Two other ropes were attached, one toward the front and the other near the rear. By proper manipulation the array can then be rotated for orientation in any direction. Other schemes for rotation can undoubtedly be thought up that would be superior to this means. In fact, several such rotation designs have already been presented in *QST*.² The above method of rotation, although having distinct disadvantages, can be made to work and happens to be very inexpensive.

In Fig. 1, showing the schematic plan view of the array, A-A' consists of two 20-foot bamboo

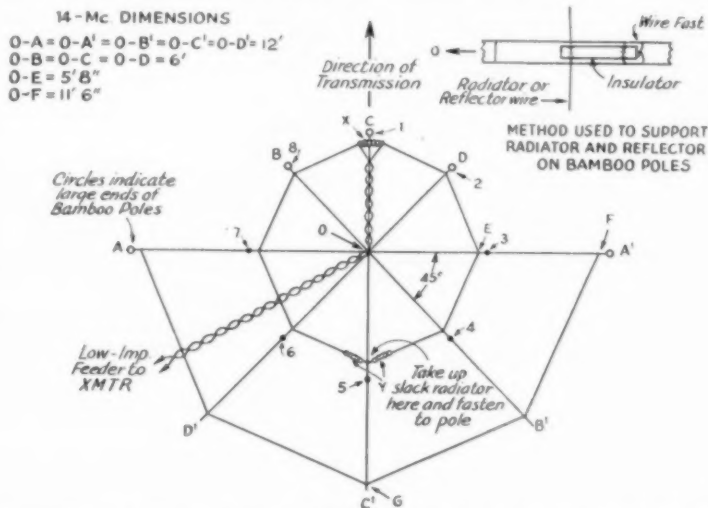


FIG. 1—SCHEMATIC PLAN OF THE ANTENNA AND REFLECTOR ASSEMBLY FOR 14-Mc. OPERATION

fishing poles, so lapped that a total length of 24 feet is obtained, the poles being lashed together large ends out. B-B', C-C', and D-D' are 20-foot single bamboo fishing poles with their small ends trimmed off slightly after the array has been as-

(Continued on page 90)

² M. P. Mims, "All-Around Signal Squirrel," *QST*, Dec., 1935; F. G. Southworth, "Antenna Rotating Device," p. 39, *QST*, June, 1936; B. T. Simpson, "Square 'Signal Squirrel,'" *QST*, Oct., 1937.

... 78° North, 72° West

MacGregor Expedition Wintering in Greenland

By A. G. Sayre, W2QY-OX2QY

Contact with far-flung expeditions has always been a fascinating part of amateur radio. Since 1923, when Don Mix operated WNP on 220 meters, amateurs have provided communication for explorers at all corners of the earth. Amateurs followed Byrd on the Chantier, KEGK, to Spitzbergen and later to Little America. Adventurers in the Brazilian jungle, Central America, Africa and Tibet have found amateurs of inestimable help. Capt. Bob Bartlett and his Morrissey rely on amateur operators on each trip to the northern latitudes. Now we find Capt. C. J. MacGregor and his followers frozen in for the winter at Reindeer Point, northern Greenland. Gerry Sayre, W2QY, operates OX2QY and puts a remarkable signal into the States at all times of the day on both 'phone and c.w. The following story was taken at W1EH in about 45 minutes with Gerry doing the talking and one of the Hq. stenos doing the work.—EDITOR

THRILLS, adventure, exploration, research vacation, hard work—these may all be the fruits of the radio operator's job on many present-day expeditions. Thrills? Yes! When a bowsprit carries away in a storm . . . when a fire breaks out immediately below decks with several thousands of gallons of gasoline forward . . . when someone is overcome by fumes from an exhaust-pipe leak: those are the moments. Hard work? Yes! Schedules at odd hours often calling for all hands to turn to and try to start the cussed engine, stiff with cold oil and grease . . . and then, when you get all fired up, ready to go, moisture condensed on radio-frequency gear is so heavy that there are flare-ups and you have to get going in easy stages. . . . Troubles arising just as you are about to go on an N.B.C. program . . . signals dropping out in the middle due to magnetic storms and everybody putting you on the spot because of it. . . . All in all, it makes you wonder if things will ever get back on an even keel.

Adventure, exploration, research? Yes—all of these, too. The various things which come up at a moment's notice—unexpected, exciting, demanding all of one's fund of knowledge to cope with changing conditions—really invite one to enter upon such a trip as this. Put yourself in my shoes and figure out just how much of a kick you'd get out of it. Yes, indeed, there is never a dull moment on such a venture. I'm mighty glad I had the opportunity to go.

Seven weeks before sailing date of the MacGregor Arctic Expedition I was notified that the radio job was mine. Manufacturers were immediately contacted, but I found they would not meet our sailing date. So it was up to me to obtain the parts for the complete transmitter.

This resulted in fourteen-hour days as a routine job in preparation. I first contacted several amateurs who had operated on other expeditions to get their opinions as to what I should expect and what preparations I should make. With their suggestions I came to the following conclusions: the transmitter should have approximately 500 watts input to the final stage; all material should be the best available and worked within their ratings; it must be very sturdily constructed to withstand the rigorous usage it had to go through; it must

be able to cover a broad range of frequencies from 6 Mc. to 15 Mc. and possibly more; it must be capable of full one hundred per cent modulation on any of these frequencies and should rely on plug-in coils instead of band switching. All materials used for insulation must be as near non-hygroscopic as possible, and the transformers be very well impregnated and filled with suitable compounds thereby keeping moisture out of the windings. The rig would need to allow easy servicing and be constructed with the idea of taking it ashore upon our arrival at our base camp. From all these ideas a layout was decided upon and work started.



LOCATION OF OX2QY



**THE COMPLETE TRANSMITTER
IN TWO CABINETS**

All-band exciter, driver, a final and antenna coupling units comprise the r.f. unit at the left. All power supplies and audio gear are in the right-hand cabinet.



**A. G. (GERRY)
SAYRE**

On such a trip spare parts of every kind must be carried, for one never knows when some accident will destroy some part of your rig. By spare parts I refer to every little detail down to lock washers, solder, lugs, hook-up wire, sockets, condensers, resistors, transformers, tubes, bolts and nuts, bakelite and aluminum for construction work; insulators and wire for the antenna, feed wire as well as spare parts for the engine, such as plenty of plugs, condensers, points, fanbelts, bearings, pistons, rings, relays, etc.

The engine will run more in radio service as we are using it than your car engine will run in about two years of hard usage, so you can all understand why I mention the bag of parts. Too much emphasis cannot be made on these spare parts, for otherwise we might find ourselves off the air because of lack of suitable essential spares. It entails more than just throwing together a few essential things and trusting to good luck that you maintain your broadcast, ship and amateur schedules.

At this point I want to say that I have always greatly appreciated the amateur spirit of coöperation. But the Newburgh radio amateurs really helped in countless ways with their aid and their suggestions. John Smith, W2BCR, helped me at all times. He worked his regular job during the daytime and then would come over and work a good share of the night assisting me until late. He left work for four days at the end to assist me. To him and to all the others I have a huge "Thanks a million" for their untiring efforts. This spirit I find daily in contacts over the air assisting us in relaying traffic and getting schedules arranged from up here in the Arctic. It was just the same at Lunenburg, Nova Scotia, and Sydney, which were ports of call. At those ports I was certainly glad I was an amateur. The other hands of the expedition found it hard to understand why these strangers should so suddenly become interested in my problems and could not understand how I seemingly had located a long lost friend when meeting a new amateur. I greatly appreciate all you boys did for me up there. To VE1GH, VE1CD, VE1GC and VE1CR goes another huge vote of thanks for their hospitality and assistance. I assure you it was greatly appreciated.

Ship antennas supposedly work out well. Our ship is a three-masted schooner rig and with plenty of steel cable. We found it very hard to get up a stable antenna. A Marconi antenna partly vertical and partly horizontal was tried. But the first time the sails were hoisted it was carried away by the main sheet gaff. Finally a doublet fed with Bassett cable was installed between the

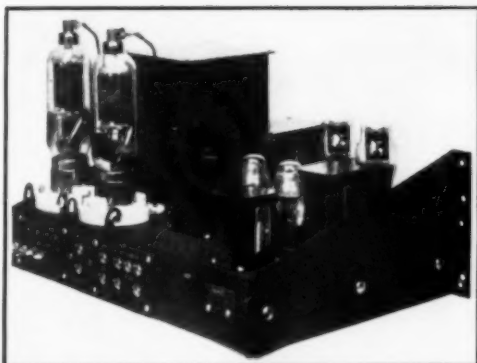
**CAPT. C. J.
MACGREGOR**



forward and main masts and worked out very well. Another vertical antenna running up outside of the shrouds mizzenmast was tried and found to work well. We had installed a large copper plate on the hull to get a good ground. The antennas were completely remodeled in Nova Scotia during other repairs to the ship. Pyrex insulation was used throughout.

Antennas ashore are always a major problem on expeditions of this type. No timber being present, we were forced to bring our own masts, and all equipment that is needed for antenna supports. Work is extremely hard due to the rough, rocky, steep slopes. We do not have suitable room for separate antennas for such frequency coverage. So we had to fall back on the antenna that could be operated covering more than a two-to-one frequency range and which was not in harmonic relationship. Finally we decided upon a diamond or rhombic antenna as large and high as possible. We found one spot that was 500 by 200 feet where we could get a line approximately two degrees west of true south, aiming at New York, with the north end about 50 feet or more above the lower end of the antenna off the beach, or south, end. A high cliff arose 1000 feet immediately in back, to the north. To the south, fortunately, we have an open way about one and one-half miles wide before it comes to the steep banks of the shore. Across the fjord this bank rises about 1000 feet also. On the eastern leg the pole had to be set on the further side of a ravine with rocks piled around it to keep washouts from bringing it down during freshets.

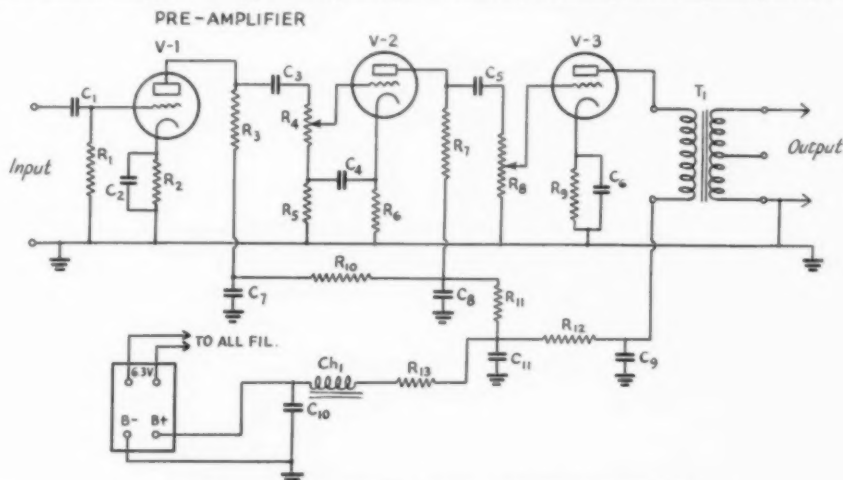
All this makes the ground appear very irregu-



THE DRIVER AND MODULATOR

lar when viewed from the antenna. This may distort the calculated radiation pattern of a good rhombic. Reports indicate that this is true, for we get similar reports from most parts of the States. The antenna is 275 feet on each leg, with side angles of about $62\frac{1}{2}$ degrees. The height is about 35 feet, making the 580-ohm feed line about 350 feet long. We installed an 800-ohm Ward Leonard plaque resistor.

A little cut and try on the best side angle has been done to get the best signal into New York City to maintain our NBC and other commercial schedules, also to get our best signal on the higher frequencies. Enough contacts have not been made to formulate any real conclusions except to let us know that it has a good coverage and ample for our needs. We also use it on standard broadcast receiver, boosting those signals perceptibly.

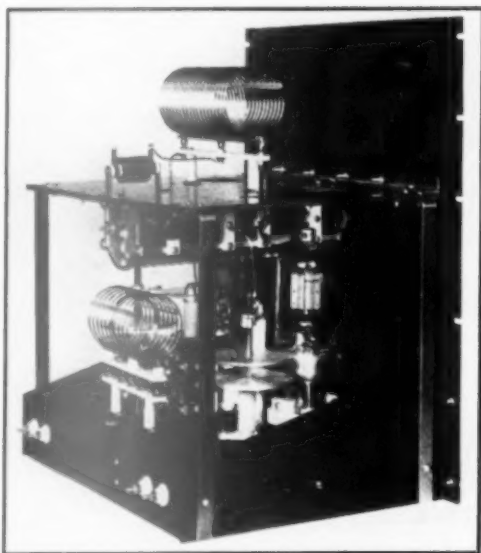


(FIG. 1—PRE-AMPLIFIER OF OX2QY TRANSMITTER)

C₁—0.006- μ f.d. (Cornell Dubilier).
C₂, C₇—1 μ f.d. (Cornell Dubilier).
C₃, C₅—0.05 μ f.d. (Cornell Dubilier).
C₄, C₆, C₈—0.5 μ f.d. (Cornell Dubilier).
Can type PE-4-6888.
R₁, R₃, R₇—250,000-ohm, 1-watt (IRC).

R₂—8000-ohm, 1-watt (IRC).
R₄, R₅—250,000-ohm v.c., 1-watt (IRC).
R₆—50,000-ohm, $\frac{1}{2}$ -watt (IRC).
R₈—4000-ohm, 1-watt (IRC).
R₉—1000-ohm, 2-watt (IRC).
R₁₀—50,000-ohm, 2-watt (IRC).

R₁₁—25,000-ohm, 1-watt (IRC).
R₁₂, R₁₃—2500-ohm, 2-watt (IRC).
CH₁—Type T-156 (Kenyon).
T₁—Type T-101 (Kenyon).
V₁, V₂—6F5G (Sylvania).
V₃—6C5G (Sylvania).
All chassis, panels, and racks are Par-Metal products.



THE FINAL AMPLIFIER AT OX2QY

Standard units were used throughout. The high-power final shows compact, neat construction. The grid circuit and neutralizing condensers are on the level of the tube sockets. The plate circuit is over head as the plates of the tubes are brought out at the top.

Possibly a little discussion of the hardest job we encountered on the whole trip would be of interest to some of you fellows. It was the erection of the antenna. Poles about 40 feet long and 6 to 8 inches in diameter were stowed aboard in Nova Scotia. These were thrown over the side of the ship, towed ashore at high tide by use of row

boats. Four members of the expedition now shouldered a single pole and carried it up a steep butte about 30 feet high, then about 500 to 1000 feet from their first position. If you can visualize one man standing up over a rock, another over a hole between rocks and possibly slipping down helping the others to carry their share, you will then understand the two solid days we spent at this work. Then came the blasting of holes with dynamite, placing guy wires, cutting holes for the dead-man anchors which we made of 2 by 8's, four feet long, buried. The poles were finally hoisted and stood on end in their holes. Securing the guys to the dead-man anchors and piling stones about four feet high around the base of each pole was the next operation. The leaning back brace is one-quarter inch cable wire; the other two are No. 10 wire split up with insulators. Three 2 by 4 braces were also installed about fifteen feet above the ground to check any slipping of the pole. We used No. 10 copper clad steel wire for all antenna, feed line and guy wires. The antenna is one piece from the south end up to the north end, down the feed line and into the shack, thereby doing away with corrosion joints which sea water makes worse. The feed line is mounted on seven pieces of 2 by 4 stuck up in the rocks and stones piled around them. Cross beams are nailed on these and pyrex insulators are used to keep the feed line uniformly placed between poles.

Ice, sleet and snow have all been encountered to date and the antenna seems to be able to take it. You may doubt that we have high winds up here so I will just mention one little instance to show you what happens. Our schooner was

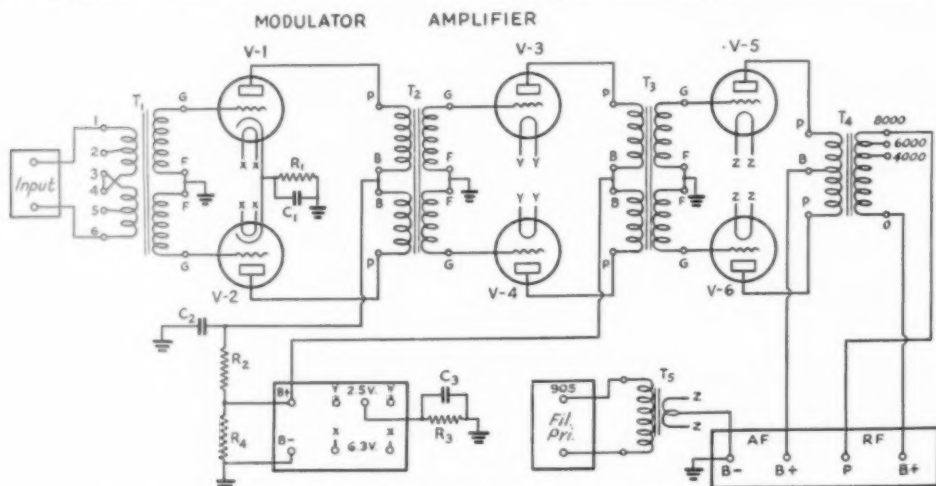


FIG. 2—AUDIO DRIVER AND MODULATOR

C₁—0.5- μ f, (Cornell Dubilier DA-4050).

C₂, C₃—2- μ f, (Cornell Dubilier DA-4200).

R₁—600-ohm, 1-watt (IRC).

R₂—10,000-ohm, 2-watt (IRC).

R₃—500-ohm, 100-watt (Ward Leonard WL-507-215).

R₄—20,000-ohm, 50-watt (IRC-PF4).

T₁—Type T-3 (Kenyon).

T₂—Type T-54 (Kenyon).

T₃—Type T-259 (Kenyon).

T₄—T-470 (Kenyon).

T₅—T-361 (Kenyon).

V₁, V₂—6C5G (Sylvania).

V₃, V₄—2A3 (Sylvania).

V₅, V₆—905 (United).

anchored here in harbor with two anchors out and a ten-inch hawser ashore. We had not been ashore when this occurred and fortunately for us. One of these gales came up and snapped the hawser, broke one anchor chain, and we started to drift rapidly on to the beach. It was necessary for us to put out to sea for our motors would not hold us against the breeze. When it subsided in thirty-six hours we were able to get back in again. These winds seem to come up very rapidly and reach about 75 miles an hour gale force.

Power is obtained from a U. S. Motors four-cylinder four-cycle gasoline engine which is directly coupled to a 5-kw. 110-volt a.c. generator. It uses nearly a gallon of gasoline per hour to operate the complete rig and receiver. Suitable by-passing on the generator cut out was imperative. By-passing on the generator armature and field exciter armature and field were found absolutely essential to good receiver operation.

The engine and generator were too heavy to move ashore in one unit as they were too bulky. They were lowered separately overboard into smaller boats and hauled ashore. Here all hands had to use 2 by 4 pieces over their shoulders to lift them out of the boat and up the ledge to the deserted Eskimo igloo which we use for our shack and power house. All of this was much more hard work than you may think, down there where everything is provided for human ease. The essential extra gear included a battery stand-by re-

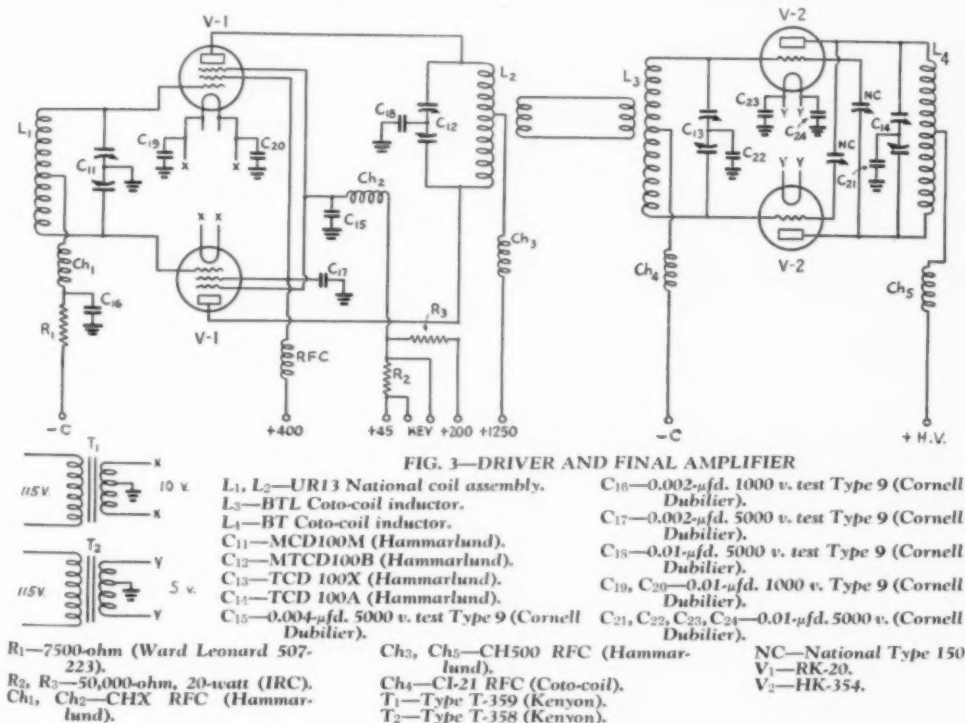
ceiver—radio analyzer, signal generator, spares of all kinds, code practice oscillators for the crew, thereby getting practice for their work of exploration next spring when the sunlight returns to us. I find that they are very much interested in learning the code, which will come in handy when they get out on the trail. To date the only failures have been composition feed-through insulators, condensers and tubes. Moisture and temperature changes have accounted for most of these.

Other things I brought with good reason were a torch of the alcohol variety, materials for grinding crystals from blanks and wire of all varieties. I had thought I had enough wire to last indefinitely but the supply is getting low already.

There is no dull or idle moment to date on this trip so far as I am concerned. There are always any number of things still to be done before a complete darkness sets in on us for the winter. Then we will need preparations for the trail parties such as camp duties to which all of us are subject, of course.

To date most all of my listening and work has been on frequencies between 18 and 8 Mc., mainly commercial broadcast and ship's band work and news which is handled by the *New York Times*. I wish we had more time and found it possible to use enough gasoline to work more amateurs during some of the evenings. Those we have had have been very pleasant and fine contacts. So far no

(Continued on page 94)



● ARMY-AMATEUR RADIO SYSTEM ACTIVITIES ●

Code Speed Contest

ON Monday, December 6, 1937, WLM/W3CXL will broadcast a speed contest. All amateurs, whether A.A.R.S. members or not, are invited to participate. The contest will start at 10:00 P.M. E.S.T. WLM/W3CXL will use automatic equipment and sufficient power to reach most states. The frequencies 6990 and 3497.5 kc. will be keyed simultaneously.

Speeds will vary from 20 to 60 w.p.m. in jumps of five words per minute. Clear text will be transmitted for five minutes at each speed. Each speed will have different text, and words will be counted on the basis of five letters to the word. The contest will be run according to the following rules:

1. Anyone having a valid amateur license is eligible.

2. Only one report can be turned in by each participant. Pick out the speed which you are sure is correct.

3. Solid copy for one minute anywhere in the five-minute transmission will determine qualification.

4. A.A.R.S. members should send their copies to their Corps Area Signal Officer.

5. Non-members should send their copies to the nearest Corps Area Signal Officer. List of addresses and states comprising each Corps Area was published in November *QST*.

A.R.R.L. will give letters of commendation to League Members who stand highest in each Corps Area.

A.A.R.S. MESSAGE FORM

The following description gives the message form used by the A.A.R.S., and hints for copying the same on a typewriter:

43 WLMA V 19

STATECOLLEGE PENNA 400P OCT 22 1937

MISS LUCILLE MOORE

EIGHT NEWCUMBERLAND PLACE

NEWYORK NY

LETTER RECEIVED FROM MARY WHO IS IN

NEWYORK STOP FAMILY JOIN WITH ME IN WISHING

YOU A HAPPY BIRTHDAY

FRANCES

WLMA 504P 22

First line: write the number, station of origin, operator's sign and check.

Third line: place of origin, filing time (if any), and date.

Fifth line: the name of the addressee.

Seventh line: one space after the last word of the addressee's name, the address, giving number and street.

Eighth line: name of the city immediately under street and number.

The body of the message starts at the left on the tenth line. Copy ten words to the line. At the end of the fifth, fifteenth, twenty-fifth, etc., word, a double space should be left to aid in counting the check. New York is written NEWYORK, as are all names of places, and counted one word.

Two lines under the last word of the body appears the signature. If the last word of the body is too far to the right, start the signature two lines down and in the center of the blank. The message is serviced by the receiving operator by placing the call letters of the transmitting station two lines under the signature, followed by the time of receipt and day of the month.

As the message is being copied between the fifth and tenth lines, a new blank may be placed in the typewriter so that upon the removal of the completed message the new blank appears in approximately the right position for the next message. If carbon copies are made, considerable practice is required to get the new blanks in at the proper time.

A service message is shown below. It does not have a check and the place of origin and date are shown after the signature. Service messages should contain only data relating to traffic schedules or operation.

64 WLM SVC

WLMA STATECOLLEGE PENNA

YOUR FORTY THREE OCTOBER TWENTY SECOND
PLEASE REPEAT ADDRESS

WLM WASHINGTON DC OCT 23

ZCB CONTEST RESULTS

Final scores of ZCB (QSO) Contest held September 13, 1937, are shown below. The contest lasted from 5:00 P.M. to 1:00 A.M. local standard time. Five minutes were required to elapse from the beginning of one contact to the beginning of the next. Stations exchanged their locations. Each contact counted one point.

The scores, by Corps Areas, and the scores of the individual stations having high score follow:

C.A	Points	Handicap Factor	Total	High Station	Points
I	118	2.4	283.2	W1JMY	33
II	390	1.2	460.0	W2DBQ	38
III	1085	1.9	2061.4	W8GMZ	75
IV	145	3.4	493.0	W4AWO	19
V	366	2.1	768.6	W8LII	35
VI	211	1.5	295.4	W8ONK	35
VII	715	1.9	1358.5	W9BNT	53
VIII	416	3.4	1314.2	W6KFC	53
IX	2267	1.0	2267.0	W6CVL	56

(Continued on page 38)

Designing the First Stage of the Speech Amplifier

A Pentode Circuit for Low Hum and R.F. Pickup

By Thomas A. Cross,* WIJZM, VE1IN

THE input stage of a speech amplifier largely determines the performance of the whole amplifier. So much can be done by intelligent design of this stage to reduce r.f. pickup, "motor-boating" and hum that it is worth while to study their design.

Most amateurs start out with two strikes against them in their efforts to obtain good amplifier performance by using a triode in the input stage. The pentode embodies many advantages which greatly outweigh their slightly increased cost. Changing a triode over to the pentode circuit will result in extended high frequency response, higher gain, and greatly reduced r.f. pickup.

The increased gain may be expected, but many are not aware of the other two advantages made possible by the pentode. The reduction of radio frequency is a result of the improved isolation afforded by the pentode circuit. The shielding of the screen grid has a similar effect to the neutralization of a triode speech amplifier tube. Indeed, triode speech amplifiers in broadcasting stations are usually neutralized.

The high frequency response can be extended when using a pentode because of its lower capacities. The pentode can work into a higher load impedance for a given high frequency attenuation than is possible with a triode. When a triode is used with a high loading resistance, as is necessary with the high-mu tubes, the higher speech frequencies suffer attenuation. On the other hand, pentode amplifiers can give reasonable gain even at frequencies used in television amplifiers.

In the accompanying diagram of Fig. 1 is the circuit of a simple but very effective speech input amplifier, combined with the coupling network to the following stage. It is not intended that the circuit be copied exactly as shown. The amateur should make changes necessary to accommodate his requirements for frequency response, available supply voltages, etc.

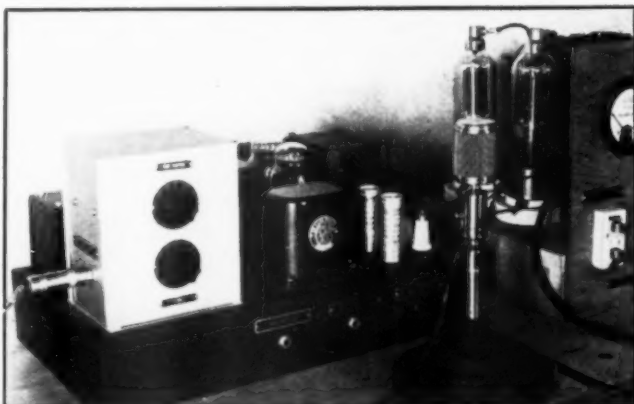
Most of the pentode tubes can be used in this

* Bowdoin College, Brunswick, Maine.

circuit without changing the circuit constants. The 6J7 tube is suggested because it is small, self-shielded and is of the sharp cut-off type. Sharp cut-off tubes have higher gain and lower plate current than the variable-mu tubes. The last point is important because lower values must be used for the decoupling resistor R_4 and the plate loading resistor R_5 . Representative of the sharp cut-off types are the 57, 6C6, 6J7, and the 954. The last tube, one of the acorn types, can be used to advantage in very small amplifiers.

Many prefer to use a bias cell in place of the cathode-resistor bias system shown in the diagram. This practice is desirable when a large condenser for C_2 cannot be obtained. The bias battery might cause trouble, however, when strong r.f. fields are present and there is grid rectification of the r.f. voltage.

The recommended values for the circuit con-



THE PENTODE INPUT STAGE ELIMINATED R.F. PICKUP IN THIS SPEECH AMPLIFIER UNIT BUILT BY THE AUTHOR FOR THE BOWDOIN EXPEDITION STATION, VE1IN

stants are given in the diagram. Some of these constants may be altered to adapt the amplifier for the amateur's particular needs. For instance, R_5 and R_6 should be reduced from the indicated values when the available supply voltage is less than 250 volts. They may be replaced by high-impedance audio chokes to keep the gain up to a satisfactory level. The chokes have a lower d.c. resistance with high impedance at audio frequencies, which permits high gain with low supply

voltages. However, chokes should not be used except under special conditions because they tend toward hum and frequency distortion.

The combination of the gain control, R_7 , and the grid leak for the second stage, together with the coupling condenser, C_5 , is capable of frequency discrimination. An increase in either C_5 or R_7 , or both, will bring up the bass response. With the values indicated in the diagram cut-off will begin at approximately 150 cycles, which is satisfactory for most amateur applications. If it is desired to attenuate the low frequencies further, to improve intelligibility or reduce hum, the con-

When selecting condenser C_5 choose only one of the very best quality. If the resistance of the condenser is below 500 megohms, the bias on the following tube will be affected. Use a mica condenser if possible.

The cathode resistor by-pass condenser should be as large as is consistent with cost. It has been a practice to use a condenser as small as is needed for satisfactory bass response. It may seem logical to attenuate the low frequencies by reducing its value and thus cause degeneration at those frequencies. However, if this condenser is smaller than 10 μ fd. the hum level will increase. A very pronounced hum will result if the heater leads are not balanced to ground with a center-tapped resistor or filament transformer secondary. I have

noticed that this hum will develop even when d.c. is used on the filament unless the leads are center-tapped or at least one side connected to ground.

A very common mistake that is made, even in many published circuits, is to use decoupling in the grid circuit of any resistance- or impedance-coupled amplifier. Do not attempt to isolate the "cold" end of either R_1 or R_7 with a decoupling resistor. A decoupling network at R_1 will place the case of the microphone above ground, which will encourage hum pickup. If decoupling is used at R_7 the cathode resistor will not be by-passed and degeneration will result. However, should a transformer be used in either grid circuit, decoupling is then very desirable.

The decoupling network consisting of R_6 and C_4 should always be used, providing that the supply voltage is adequate. The network will cause a drop in the d.c. voltage on the plate of the tube but will reduce the tendency toward "motor-boating" and will iron out the ripple of the supply voltage. To function properly, the resistance of R_6 should be at least 25 times the capacitive reactance of C_4 at the lowest frequency which must be filtered.

It is desirable to locate the gain control R_7 at least one stage from the input circuit. It is then able to reduce hum and other noise which has developed in the preceding stages. Only when the magnitude of the signal voltage is great enough to overload the input tube should the volume control be situated in the input circuit.

The hum level will increase if multiple grounds are used to ground the metal braid on shielded leads. If shielded wire is used it is important that the braid have a good ground—but at only one place.

The two best tubes to use in the following stage are the 6J5 and the 6C5. The former has a lower plate impedance than the 6C5 and it is the more desirable of the two when the second stage is called upon to deliver small amounts to power. The 6C5, however, has better insulation and should be used when only voltage amplification

(Continued on page 98)

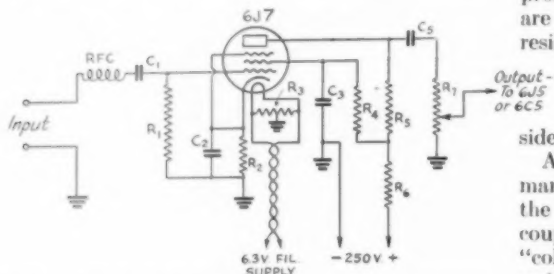


FIG. 1—THE SPEECH INPUT CIRCUIT UNDER DISCUSSION

- C_1 —0.1 μ fd.
- C_2 —10 μ fd. or larger.
- C_3 —0.1 μ fd. or larger.
- C_4 —0.5 μ fd. (see text).
- C_5 —0.006 μ fd. (see text).
- R_1 —4-megohm grid-coupling resistor.
- R_2 —3000-ohm cathode resistor.
- R_3 —20- to 50-ohm filament center-tap resistor.
- R_4 —1-megohm screen-voltage dropping resistor.
- R_5 —0.25-megohm plate resistor.
- R_6 —50,000-ohm (see text).
- R_7 —0.5-megohm volume control (see text).

denser C_5 can be reduced in size. This practice is limited because of the phase distortion which develops when very great attenuation is attempted. The dialogue equalizer or the more complicated high-pass filter provide splendid means to attenuate the bass response of the amplifier. The high-pass filter has the advantage of a very sharp cut-off characteristic while in other equalizers the attenuation obtained bears a fixed relation to the frequency.

It is important that the condenser C_5 and the resistor R_7 be adjusted not to pass more of the low frequencies than actually needed. If this rule is not followed the possibilities of "motor-boating" and high hum level is increased. The flat response required of program amplifiers in broadcasting stations is actually undesirable for amateur service. The frequencies below 200 cycles are practically useless from the standpoint of intelligibility, yet it is these frequencies which contain the bulk of the speech energy. A high-pass filter designed to cut off at 250 cycles will eliminate all of the hum (up to a fourth harmonic at 240 cycles) developed in the previous stages and, at the same time, add greatly to the effectiveness of the signal.

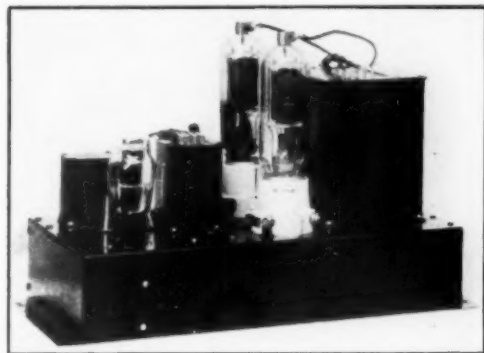
Cathode-Coupled Driver for Class-B Modulators

By R. B. Shimer*

WITH the exception of negative feedback, which has been described in these pages recently, the fundamental design of audio power systems has experienced little improvement beyond the usual absorption of the newer tubes. Of course, new innovations or circuit designs which do not lower cost or materially improve the overall frequency response, while often interesting to the amateur or experimenter, do not find favor and are obviously soon forgotten. However, when a circuit appears which is really an actual improvement over existing designs and which, furthermore, lowers the cost, then it is at least worthy of consideration.

Recently there has come to the audio field a new innovation in the way of drivers. These are called "cathode drivers," since the driver transformer, instead of being in the plate circuit of the driver tube or tubes, is in the cathode circuit. This is a degenerative type of amplifier, and possesses inherently better characteristics than the plate-coupled type for certain applications.

In the circuit here discussed, it permits driving a 250-watt audio output stage with only a single receiving-type tube. Moreover, the driver tube operates Class-A, and thus may be fed directly



THE CATHODE-DRIVER CLASS-B ASSEMBLY MAKES A COMPACT UNIT

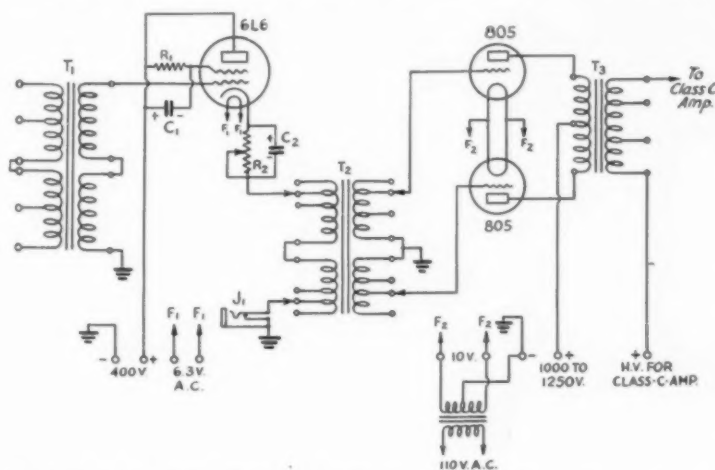


FIG. 1—CIRCUIT OF THE 250-WATT CLASS-B MODULATOR WITH CATHODE DRIVER

C₁—2- μ fd. 450-v. electrolytic.
C₂—25- μ fd. 50-v. electrolytic.
C₃—4- μ fd. 2000-v. paper.
C₄, C₅, C₆—8- μ fd. 450-v. paper.
R₁—50,000-ohm 2-watt.
R₂—1000-ohm pot., 5-watt (wire wound).
T₁—Input transformer (Kenyon Type T-2).
T₂—Driver transformer (Kenyon Type T-264).
J₁—Single-circuit shorting jack.

*Kenyon Transformer Company, 840 Barry St., New York City.

from a comparatively low-level stage.

This method of driving a Class-B output stage is highly recommended whenever it is necessary to obtain maximum efficiency with lower distortion. One of the inherent faults with existing plate drivers is that often the tube is operated Class-AB or Class-B, which necessitates the use of a driver transformer for the grids of these tubes. Aside from this, tubes that draw considerable grid current usually are characterized by inherent distortion, and

when fed into the Class-B final output stage are often responsible for the poor quality so often encountered in inefficiently designed Class-B audio amplifiers or modulators.

While the above advantages of cathode drive are highly desirable, the main advantage is its ease of operation. This particular modulator will deliver full output with an input to the driver tube of only +14 db—the output of a typical

(Continued on page 100)

A Complete Oscilloscope with I.F. Input Amplifier

By Earl I. Anderson,* W8UD

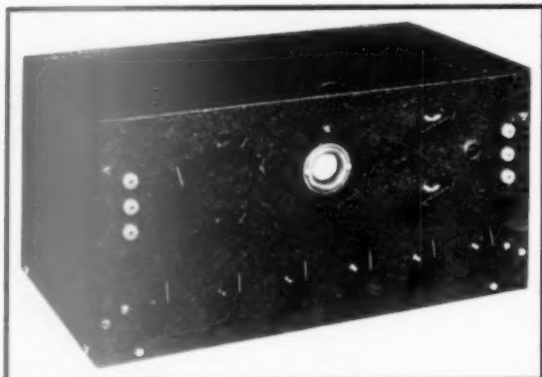
UNFORTUNATELY a cathode-ray tube is a comparatively insensitive device. Little or no power is necessary for deflection, but the voltages required are fairly high. In the case

but it is inexpensive and will serve for some purposes. Even so, this simplest type of unit is well worth while and should be a part of every 'phone station's equipment.

However, as one becomes familiar with the capabilities of the cathode-ray tube and the multitude of interesting and useful purposes it will serve, it is extremely doubtful that the user will long be satisfied with the 'scope in its simplest form. He will almost certainly desire to connect the oscilloscope to his receiver and observe incoming signals, as well as to make observations at lower amplification levels in tracing and eliminating distortion in his speech input equipment.

The foregoing considerations were the factors which resulted in the development of the unit now in use at W8UD. The completed job contains all the necessary features available in expensive commercial jobs and in addition contains an i.f. amplifier, thus making connection to the superhet receiver simple and effective. Usually such amplifiers are built separately and are not as convenient to use for that reason.

The total cost of the unit at amateur prices will be about \$30.00, including all tubes and the cabinet. However, if that cost is high enough to be prohibitive at the moment, a most excellent start can be made for \$15 to \$16 by purchasing the

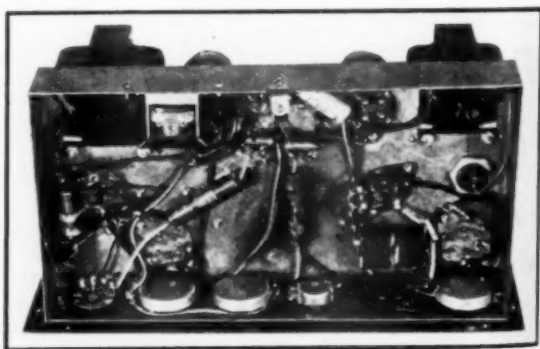


THIS 913 OSCILLOSCOPE UNIT IS COMPLETE WITH INPUT AMPLIFIERS FOR BOTH HORIZONTAL AND VERTICAL DEFLECTION, INCLUDING AN I.F. STAGE FOR RECEIVER APPLICATIONS

The controls, grouped about the 'scope tube in the center, are as follows: Bottom row, left to right—sweep sync. input, R_{11} ; fine sweep adj., R_4 ; horizontal input switch, S_3 ; horizontal amp. gain, R_{17} ; vertical amp. gain, R_{16} ; vertical input switch, S_4 . Below tube at left, coarse sweep adjustment, S_1 ; below tube at right, i.f. gain control, R_{12} . Above tube, at left, intensity control, R_{20} ; above tube, at right, focus control, R_{19} . The control at the extreme left is the linear-external-60 cycle sweep selector switch, S_2 . The input and output terminals at the left and right sides of the panels have the same corresponding positions as in the diagram of Fig. 1.

of the 913 tube about 100 to 150 volts must be applied to the deflection plates if the picture is to be as large as possible. Because the 913 screen is quite small it is necessary that full or almost full deflection be obtained or the pattern will be difficult to read. This means that unless the oscilloscope is equipped with amplifiers it may be used for observing voltages which are comparatively high but that it will not be usable for low voltages. Most units which have been described for amateur construction and those which are offered to amateurs at a low price are of this type. If no linear sweep is included their use from an amateur application standpoint is limited almost entirely to the trapezoidal pattern for observing final r.f. amplifier and modulator performance. The 60-cycle sweep usually incorporated is less usable than a linear sweep

* Douglas, Michigan.

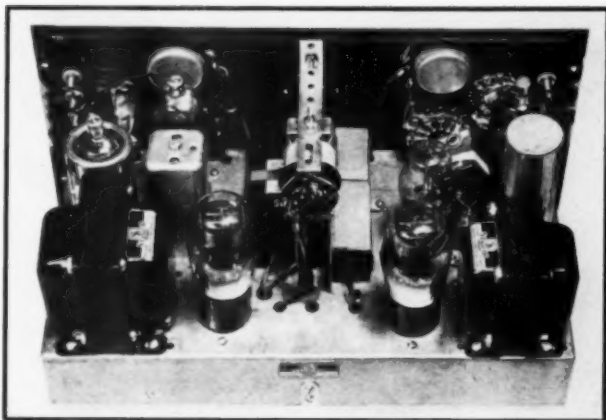


UNDERNEATH THE CHASSIS PARTS ARE PLACED ACCORDING TO THE RULE OF CONVENIENCE AND DIRECT CONNECTION

cabinet and chassis, the 913 tube, 80 tube, T_1 , R_{19} , R_{20} , R_{18} , R_8 , R_6 , C_1 , C_8 and C_9 . This comprises the simplest form of oscilloscope and

may be used to obtain the trapezoidal pattern. As finances permit, the additional parts may be added, beginning with the other power supply, 885 linear sweep circuit and horizontal amplifier. Either or both of the vertical amplifiers, i.f. and low-frequency, may be added next—and the unit will be complete.

The cabinet is a standard unit measuring 8 by 14 by 7 inches and is designed to accommodate the chassis, which measures 7 by 13 by 2 inches. There is plenty of room for all of the components and no difficulty should be experienced in getting them all in. The exact layout is not particularly important but the one shown has proven entirely satisfactory and should be followed as closely as possible. The power transformers are placed as far from the 913 tube as possible. Placed as shown, their fields do not influence the operation of the tube. Several different 913 tubes were tried and with each of them the beam centered properly so apparently no beam centering controls are necessary with this tube and none are shown. Originally ordinary



THE ABOVE-DECK COMPONENTS ARE NOT UNDULY CROWDED. THE PRINCIPAL PARTS ARE IDENTIFIED IN FIG. 2

midget receiver transformers were used for T_1 and T_2 . Their operation was satisfactory except that the heat developed was excessive and the voltage on the 913 was too high using the entire secondary for the half-wave rectifier and too low using half the secondary. The entire secondary was used with a series resistor to reduce the voltage across the voltage divider network to 550

volts. Price is perhaps the most important factor in the design of midget receiver transformers and accordingly they operate at extremely high copper and steel densities. Because of this it was impossible to operate the scope in the cabinet for any length of time without developing excessive heat which resulted in the failure of several condensers, despite the fact that large holes were cut in the bottom and top of the back with a socket-hole punch. The Standard Transformer Corporation offered to develop the special and more conservatively designed units which

(Continued on page 102)

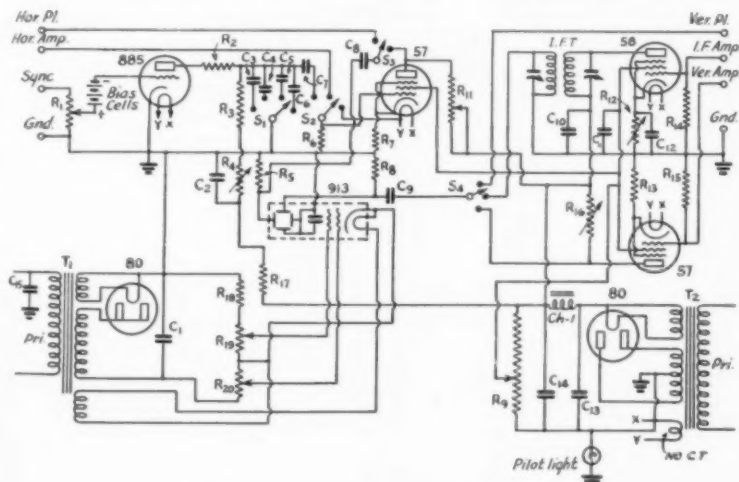


FIG. 1—THE ALL-INCLUSIVE CIRCUIT

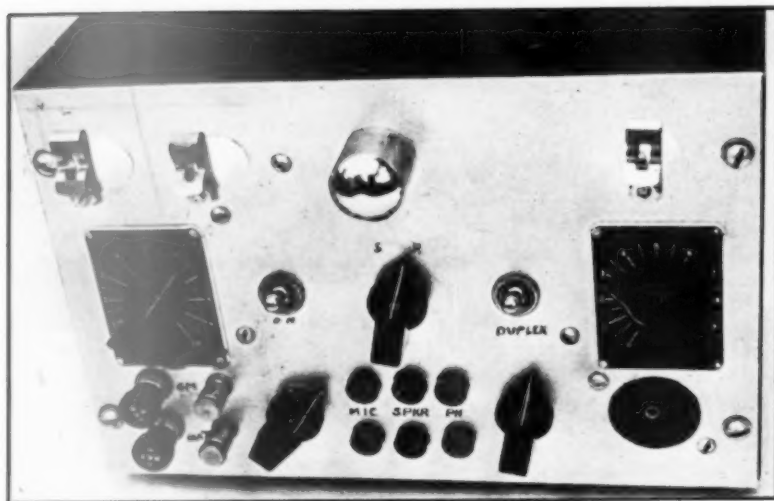
R_1 —15,000-ohm variable.
 R_2 —400-ohm $\frac{1}{4}$ -watt.
 R_3 —100,000-ohm $\frac{1}{4}$ -watt.
 R_4 —1-megohm variable.
 $R_5, R_6, R_8, R_{14}, R_{15}$ —2-meg-ohm $\frac{1}{4}$ -watt.
 R_7, R_{13} —1000-ohm $\frac{1}{4}$ -watt.
 R_9 —25,000-ohm 20-watt semi-variable.
 R_{10} —Not used.
 $R_{11}, R_{12}, R_{16}, R_{19}$ —75,000-ohm variable.
 R_{17} —50,000-ohm $\frac{1}{4}$ -watt.
 R_{18} —150,000-ohm 1-watt.
 R_{20} —25,000-ohm variable.
 C_1 —4- μ fd. 600-volt paper.

C_2 —8- μ fd. 450-volt electrolytic.
 C_3 —1- μ fd. 400-volt paper.
 C_4 —0.25- μ fd. 400-volt paper.
 C_5 —0.05- μ fd. 400-volt paper.
 C_6 —0.005- μ fd. mica.
 C_7, C_8, C_9, C_{10} —0.1- μ fd. 400-volt paper.
 C_{11}, C_{12} —0.1- μ fd. 200-volt paper.
 C_{13}, C_{14} —8-8- μ fd. 450-volt electrolytic.
 C_{15} —0.006- μ fd. 200-volt paper.
 S_1 —Single-circuit 4-position switch.

S_2 —Single circuit 3 position switch.
 S_3 —S.p.d.t. toggle switch.
 S_4 —Single circuit 3 position switch.
 I.F.T.—I.f. coupling transformer. (See text.)
 T_1 —450-volt at 10 ma., 6.3-volt at 0.9 amp., 5-volt at 2 amp. (Stancor P4027).
 T_2 —250-0-250-volt at 30 ma., 2.5-volt at 4.5 amp., 5-volt at 2 amp. (Stancor P4028).
 CH—30-henry 50-ma. choke (Stancor C1003).
 Bias cells—Three 1- $\frac{1}{2}$ -volt penlight cells.

A Compact 56-Mc. Portable-Mobile Transmitter-Receiver

By Howard C. Lawrence, Jr.,* W2IUP



PANEL VIEW OF THE 56-MC. TRANSMITTER-RECEIVER WITH CONTROLS FOR SIMPLEX OR DUPLEX OPERATION

AT W2IUP a rig was wanted that could be used for portable and portable-mobile work. Since this rig would not be installed in any one location for more than a short period of time, the complete station had to be as compact as possible, with a minimum of extras to be carted along when setting up. A summer's work with a transceiver showed that a separate transmitter and receiver were desirable, and that duplex operation is a convenience. The power consumption had to be low so that the battery drain would not be too great when operating off a storage battery and so that the power supply used for mobile work would not be too expensive.

Convenience in operation dictated that there be no vernier dials, so that the band could be covered rapidly; that the transmitter be tuned by a single con-

trol so that it would be easy to QSY to avoid QRM or to find a frequency suitable for duplex work; that the change from send to receive be made with a single switch; and that the rig be provided with a small bulb to illuminate the control panel and provide sufficient light to write up the log at night. All wires and controls



THIS REAR VIEW SHOWS THE OSCILLATOR AT THE RIGHT OF THE SHIELD PARTITION, RECEIVER AND AUDIO SECTION AT THE LEFT

*381 Highland Ave., Upper Montclair, N. J.

were brought out on the control panel so that the rig could be easily shoved against the wall or into a corner where it would not take up too much space. To keep the rig dry when operating in an open boat or in an unexpected rain storm, a box with no openings in it was needed. With all these requirements in mind the rig described in this article was designed and built.

The transmitter is a 76 Hartley oscillator modulated by a 41. The receiver is a 76 "Minute-Man" super-regenerative detector, transformer coupled to a 76 first audio. For simplex operation the 41 modulator acts as a second stage of audio driving a loud speaker. Only the first stage of audio is used for duplex operation.

The entire transmitter and receiver are built in a black crackle finished box 9 inches long by 6 inches high by 5 inches deep. The panel and chassis are $\frac{1}{16}$ -inch aluminum while the shield partitions are $\frac{1}{64}$ -inch aluminum. The aluminum work was given a dull finish by dipping it in a solution of lye and water for a few minutes (and then rinsing in clean water) after all drilling and cutting was finished. The small bowl-shaped dent in the top front of the shield was hammered out with a ball-peen hammer to make room for one of the transmitting antenna feed-through insulators. All bolts were equipped with lock-washers to keep them from shaking loose.

Starting in the upper left-hand corner of the front panel, and reading to the right, are the two transmitting antenna feed-through insulators, the panel light, and the receiving antenna feed-through insulator. Fahnestock clips were installed on the antenna insulators. At the left end of the second row is the transmitter tuning control, followed by the switch which turns the whole rig on and off when working from a storage battery and turns just the microphone battery on when working from an a.c. supply; the rotary send-receive switch which turns off the receiver, turns on the transmitter, and connects the 41 as a modulator when going from receive to send; the duplex switch which turns the receiver back on for duplex; and, on the far right, the receiver tuning control.

On the left-hand end of the bottom row are four binding posts. The 50-ma. 250-volt Genemotor input is connected to the upper two terminals and the storage battery to the lower two terminals. When working from the a.c. power supply a microphone battery of three dry cells is

connected to the lower two terminals and the upper two are not used. The plus side of the battery and Genemotor are grounded to the chassis. It is important that this polarity should not be mixed, since the Genemotor will not run and the electrolytic condenser in the microphone circuit filter will burn out if the polarity is backwards. For this reason different type binding posts were

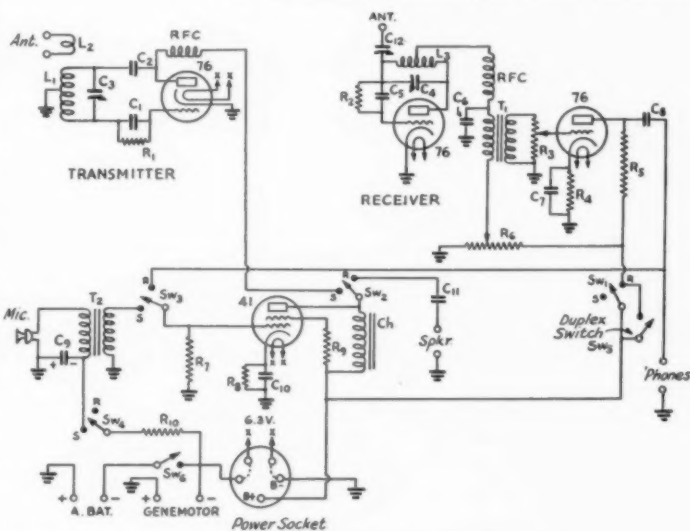


FIG. 1—CIRCUIT OF THE 56-MC. TRANSMITTER-RECEIVER

- L1, L3—8 turns $\frac{1}{2}$ -inch dia., No. 12 enameled wire, tapped at center.
- L2—3 turns $\frac{1}{2}$ -inch dia., No. 12 enameled wire.
- C1—100- μ fd.
- C2—0.002- μ fd.
- C3, C4—15- μ fd. (Cardwell Trim-Air.)
- C5—100- μ fd.
- C6—0.002- μ fd.
- C7, C10—10- μ fd. 25-volt electrolytic.
- C8, C11—0.01- μ fd. 400-volt paper.
- C9—25- μ fd. 25-volt electrolytic.
- C12—35- μ fd. midget trimmer condenser (Hammarlund EC-35).
- R1—10,000-ohm $\frac{1}{2}$ -watt resistor.
- R2—10-meg. $\frac{1}{2}$ -watt.
- R3, R6—500,000-ohm midget pot.
- R4—1500-ohm 2-watt.
- R5—100,000-ohm 1-watt.
- R7— $\frac{1}{2}$ -meg. $\frac{1}{2}$ -watt.
- R8—500-ohm 5-watt.
- R9—1000-ohm $\frac{1}{2}$ -watt.
- R10—200-ohm 1-watt.
- RFC—75 turns No. 30 d.c.c. wire, $\frac{1}{4}$ inch diameter.
- T1—3:1 audio transformer (Thordarson Type R-260).
- T2—Single-button microphone transformer (Kenyon Type KR-79M).
- Ch—42-h. 15-ma. choke (Thordarson T-7430).
- SW1, SW2, SW3, SW4—4 p.d.t. rotary switch (Yaxley).
- SW5, SW6—S.p.s.t. toggle switches.
- Dotted lines on power socket indicate connections made by Genemotor power plug.

used for plus and minus connections; one post takes a forked lug and the other a straight end of wire.

On the right of these binding posts is the receiver audio volume control. Next come two red tip-jacks for the microphone, two black jacks for

(Continued on page 112)

How Would You Do It?

Suggestion for Weather-Proof Lead-Ins

ALTHOUGH responses to Problem Number Ten did not reveal anything startling or revolutionary in schemes for bringing the antenna or transmission line into the station (we

or storm windows. Probably the best place to go through the walls, from the standpoint of appearance, is at the trimming board at the top or bottom of the window frame as suggested by W1ALJ and Alexander Marshall of Kearny, N. J. The trimming boards inside and outside provide flat surfaces for tightening lead-in insulators. Cement or rubber gaskets may be used to weather-proof the exposed joints.

Unfortunately for many amateurs, such extensive surgical operations will not be tolerated and, for these, the window usually offers the best opportunity. If necessary, the window itself may be altered considerably without permanent injury to the property because it may be replaced at little expense. The chief problems encountered in bringing the transmission line through the window are those of weather-proofing and arriving at an arrangement which will interfere as little as possible with the normal functioning of the window. We have seen no scheme which solves these difficulties better than a sufficient number of holes drilled in the glass near the top of the upper pane. The only restriction which this imposes is that the lower sash cannot be raised to its full

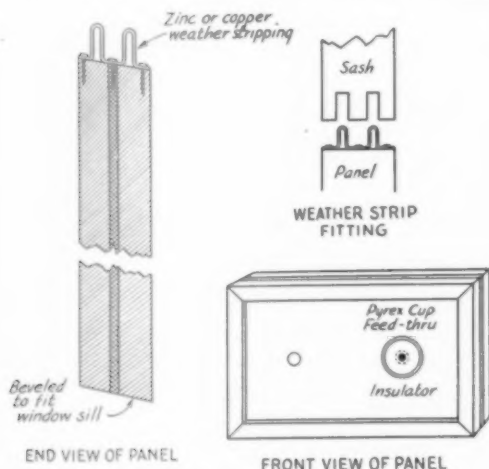


FIG. 1—WEATHER STRIP ALONG THE TOP EDGE OF THE LEAD-IN PANEL MAKES A TIGHT JOINT

hardly expected they would), nevertheless, the solutions submitted do give a good idea of the various means employed under different circumstances. A brief summary of these should be of assistance not only to those confronted by the problem for the first time, but also probably to many who find their present arrangements unsatisfactory for one reason or another.

It is realized, of course, that it is difficult to label any single type of installation "best," because few schemes can be made to serve to complete satisfaction under all circumstances. Therefore, more weight than heretofore has been given to quality of write-up in selecting prize-winners.

Several made suggestions which included cutting holes directly through the walls of the building. Where the property is one's own, or where a special "shack" is provided for the rig, this is undoubtedly the best solution, for the job can be done without great difficulty and can provide greater mechanical permanence than other schemes. It involves no interference to screening

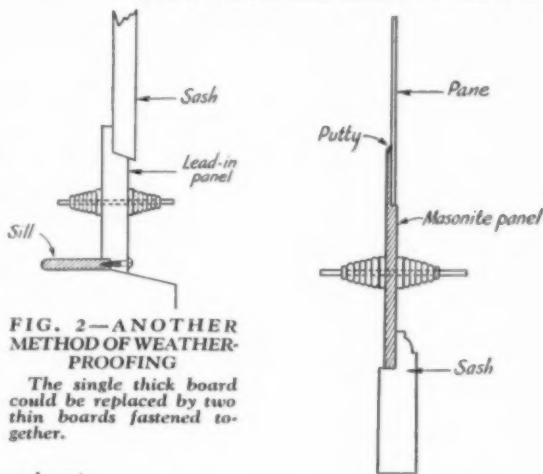


FIG. 3—A METHOD WHICH AVOIDS DRILLING HOLES IN GLASS

limit, but this is of minor importance. Stops should be provided at the proper heights to prevent accidental damage by raising the lower sash too far.

W1AUN offers the advice that much trouble will be saved if the entire upper pane is replaced

(Continued on page 112)

H A M D O M



THERE are two ways this piece might begin: A glance in the Call Book will show you that the only way you can add the country of Reunion Island to your list is by working FR8VX, for he is the only ham there.

That's the DX angle—and it may be all that matters. But if you, too, like to go behind the signals you hear and learn of the personalities back of them, then harken to a brief page from history.

In the year 1428, following a series of long and sanguinary wars extending back to the third century B.C. when the Kingdom of Annam became subject to Chinese control, that country, which then comprised most of what is now French Indo-China, became autonomous under Chinese suzerainty. In 1789, with the aid of the French government, it freed itself entirely from Chinese control.

But it was not long before France, the erstwhile ally, became an aggressor. In 1858 Napoleon III attacked Annam, acquiring successively Cochinchina and Tongking, and in 1886 what remained of the Kingdom of Annam became a French protectorate. Although technically a monarchy, ruled by the King with the aid of the Secret Council of six, it is actually governed by the French Resident-Superior and his staff.

What has all this to do with ham radio? These are the historical moves underlying the creation of a most unusual ham. But first, a little more background.

When the French took over the Kingdom of Annam they deposed the existing ruler and, in 1889, placed 13-year-old Prince Bun Lan on the throne as King Than Thai. As he grew older they found they didn't like him very well, however, and in 1907 he was forced to abdicate.

Now Than Thai had two sons, the eldest named Vinh San and the second Duy Tan. In selecting his successor the French authorities overlooked the claims of the eldest son and placed Duy Tan on the throne at the age of 7. Vinh San continued to live in Hué, the capital of Annam until 1916, however. In that year a further upset occurred, and Khai Dinh succeeded to the throne.



FR8VX

At the same time Vinh San was exiled to Reunion Island.

There's not much fun in the life of an exiled prince, but Vinh San was the sort to make the best of his predicament. Naturally of a scientific bent, he took up electricity and wireless as his



BEGINNING OF A STORM ON REUNION ISLAND

primary interests in life. In 1917 he erected the first antenna on Reunion, using a galena crystal detector, to make weather and storm observations. During three years of operation this equipment—entirely home-made, for shipments from outside are very difficult owing to the remoteness of Reunion's rockbound coast from world waterways—enabled the observance of much interesting natural phenomena. In 1919 the Prince undertook the study of earth currents, in connection with Reunion's living volcano, *Piton de la Fournaise*. His other more abstruse scientific activities include the correlation of radio conditions with cyclone formation, succeeding in 1930 in the "determination of cyclonic centers and their translation."

It was in 1920 that Prince Vinh San started in the transmitting end of radio, with a Rhumkorff coil which covered 18 miles, the first wireless transmission on Reunion. In 1924 he graduated to vacuum tubes, acquiring a small triode.

Two years later saw the start of a long agitation by him in the local press for the erection of a radio broadcasting station. From 1926 to 1930 he busied himself with a 40-watt broadcaster on 180 meters. In its early days he even built up a hundred or more receivers himself for his friends, to popularize the innovation. The station was

heard as far away as Mauritius, the call used being 04XV. Finally an official station was installed, and this activity necessarily ceased.

It was 1933 when the Prince's ham career actually began. On October 12th he had his first QSO on 40 meters, with ZS2A. The call then was FB8VX, which he used until November, 1935, when he changed to the present FR8VX. In short order he worked all continents, using both 7 and 14 Mc.

In December, 1935, he had the idea of observing radio conditions at the top of *Piton des Neiges*, an extinct volcano which is the highest point on the island (3069 meters high). Together with Paul Bunderwoet, formerly a radio officer with the French commercial navy, he camped for 12 days in a natural cavern near the top. With a portable transmitter using flashlight cells and operating with less than 2 watts many QSO's were made with Australia and South Africa. A commentary on the normal climate of Reunion is the Prince's emphasis on the weather conditions at the peak, where there was "such a cold that wooden fire was needed from sunset to next morning."

Now FR8VX—as no real DX man needs to be told—works regularly on 14,340 or 14,430 (approximately) kc. or the 28-Mc. harmonics of these frequencies. His first W contact was W8MAH. The first in each of the other U.S.A. call-letter areas were W1FOZ, W2HPL, W3CHG, W4EF, W5EBT, W6CNX, and W9NBM. He has no W7 yet!

The normal power is 20 watts, with no more than 40 at any time. The Prince finds W's hard to work, the only good time being 2300 G.T., but then static and QRM are both bad. He often hears five or six W's on the same channel—so when he reports QRM you can be sure he really means it.

His regular operating periods are from 1800 to 2200 GT (10 P.M. to 2 A.M. his time). The first two hours are usually spent on 14,340, while during the last two he moves to the edge of the band to avoid W QRM.

All in all, FR8VX is still another remarkable example of the inscrutable ways of Fate. But it is an interesting reflection to note that one who might have been the ruler of five million people finds an all-absorbing interest in our common hobby of amateur radio. Pretty good, at that, isn't it?

—C. B. D.

The Northwestern Division Convention

WHEN, in spite of a registration fee of only \$1.00, 233 hams and their wives vote the resulting convention just about the most enjoyable affair they ever attended, that is news! That, however, is precisely what happened this year on

the occasion of the Northwestern Division's convention August 28th and 29th at Sunrise Park, on the slopes of Mt. Rainier and the reaction can be attributed to three things: First, intelligent planning by a thoroughly competent committee; second, a convention site of unsurpassed beauty, affording numerous opportunities for hiking, fishing and photography, and third, the unusual amount of visiting and friendly hamming directly attributable to the "cabin life" of the gang during their stay.

The gang started assembling anywhere from several days to—in at least one case—a whole week before the convention (and it may be said that those who didn't, wished they had!). Accommodations at Sunrise are provided by cabins and this was responsible for an unusually friendly atmosphere. Many of the gang brought along their wives, and housekeeping on a small scale was started up all over the place. Not only housekeeping was started, however—so was ham radio! We won't say there's never been a convention with as many portable rigs in active operation but we will say that if there has, we don't know about it. From the moment the gang got settled in their respective cabins hams were crawling all over the place putting up temporary masts and stringing antennas. Long before the evening of the first day rigs were operating in c.w. and 'phone on every band except 160 (and only the loss of a couple of tubes prevented at least one rig being on that band!). And what conditions! . . . signals rolled in from everywhere and, judging by reports, rolled out similarly.

If the reactions of most of those attending mean anything, the affair would have been just as successful whether there'd been a program or not. In justice to the committee and guest speakers, however, it is to be recorded that there was an excellent program, just right in length, comprising two technical sessions on Saturday and Sunday, a League meeting, a hugely successful dance in the big Park lodge on Saturday night (music thanks to W7MD) and a final picnic on Sunday afternoon where various merchandise prizes were distributed in addition to three cash prizes of \$30, \$20 and \$10 donated from the surplus funds of the convention (we *still* don't know how it was all done for \$1.00!—W1JFN). In between all this, the convention committee had wisely left plenty of time for mountain climbing, hiking on the many splendid trails nearby, fishing, photography (we've come to the conclusion that most hams are also pretty keen about photography), and plain hamming. There was plenty of each.

Speaking for ourselves (W1JFN), anytime the NW Division gang holds another convention at Mt. Rainier, we'll break both legs as many times as may be necessary to get there. However, we'll do three things we didn't do this time: first, we'll

get there earlier; second, we'll take along plenty of camping gear so we can cook our meals in our cabin, and third, we'll positively have our portable rig along, too!

—W7DXF + W1JFN

The 1937 West Gulf Division Convention

THE Eleventh Annual West Gulf Division Convention was held in Houston, August 20th and 21st. It was a huge success, having a larger attendance than any previous West Gulf Division convention—265 hams. Numerous prizes were donated by the manufacturers, and nearly everyone went home with one. Among the distinguished guests present were President E. C. Woodruff, representing A.R.R.L., Dr. J. S. Waters of Rice Institute and Mr. and Mrs. John L. Reinartz.

Every item on the convention program went off exactly on schedule, and a great deal of credit is due the Houston Amateur Radio Club for their excellent management. Through the sale of advertising space they were able to provide \$4.50 worth of entertainment for each \$3.50 registration.

Next year's convention is scheduled to be held in Carlsbad, New Mexico.

—W5BKW

Strays

"Have you ever mounted a shield can on a metal chassis and found it hard to mark the holes for drilling?" asks W8KQZ. He supplies a kink to make it easy. Place a small piece of adhesive tape on the chassis at the approximate location of each hole, place the shield can in exact position, and with a long pencil mark on the tape where the holes are to be drilled. Remove the shield, and twist a sharp knife point through the marks and tape into the metal. Drill through the tape; it will prevent the drill from creeping sidewise.

What the League Is Doing

(Continued from page 22)

No More A-2 On "10" Type A-2 emission, even of a nature not involving frequency modulation, is no longer permitted in our 28- to 30-Mc. band. On October 5th, the F.C.C. amended our Rule 375, stating the frequency bands on which A-2 may be used, so as to limit it to the frequencies above 56 Mc. Thus the 28- to 30-band is now governed by precisely the same regulations applying to our lower-frequency bands as concerns the quality and types of output.



DIXIE JONES' OWL JUICE

EVER sense I been a ham I been readin' pieces in QST about why don't us rabble make more deliveries and stop scrunching up nice little hamgrams in a wad and chunking 'em into the wastebasket and anybody that does that should oughto have his mojlulator busted over his head. Wells'r, I agree. So he ought, and the chances are he oughto have it done anyway for sumpn else, but what gits my nanny is to have some egg I never heard of deliver the same message I do. There is sucha thing as overdoin' this delivery business. For instance, I git a message that I can't do nothin' with but mail it so I write it up and I lick a nice shiny stamp and stick on it and then on account of I done a good deed and upheld the integrity of amateur hammery or sumpn I set down quiet and lay my ears back and purr at myself, and purty soon what happens? Wye in about a week in comes a letter from this bloke which says: "dear w4ir, I thank you very kindly for mailing me the message but I done got it sooner from W11XYZ and once was enough." I sware, I wish hams would deliver their own dang messages and leave mine alone.

—W4IR of the "Dixie Squinch Owl"

The Cover

AS THE key symbolizes c.w. transmission and the microphone radiotelephony, so the Iconoscope—the television eye—may be considered to symbolize television transmission. What could be more appropriate, therefore, than a picture of this gadget for the cover of the issue in which we dive into the television field? Our thanks to William Haussler, NBC and to RCA for the photograph.

Circulation Statement

PUBLISHER'S STATEMENT OF CIRCULATION AS GIVEN TO STANDARD RATE AND DATA SERVICE

This is to certify that the average circulation per issue of QST for the six months' period January 1st to and including June 30, 1937, was as follows:

Copies sold.....	43,045
Copies distributed free.....	420
Total.....	43,465

K. B. Warner, Business Manager
D. H. Houghton, Circulation Manager

Subscribed to and sworn before me
on this 28th day of September, 1937
Alice V. Scanlan, Notary Public

HINTS and KINKS for the Experimenter



Combining the Frequency Meter, 'Phone Monitor, and Keying Oscillator

By Stan Comach, VE2EE

ONE of the most indispensable items of the well-dressed and operated ham station is the monitor, and no law-abiding amateur should think of doing without one even in these days of extensive crystal control. The best of crystals act up at times and the best of transmitters cannot always, therefore, be depended upon to perk merrily along right where it belongs; the only safe thing to do is consistently to check its operation to make sure that the signal is all in one lump, all in one place. The writer speaks from experience, remembering very vividly the expenditure

peetingly I decided to build something that could be trusted.

A search through *QST* brought to light an article entitled "Combining the Frequency Meter and Monitor," and working along these lines I started in to build a reliable piece of equipment. The question of stability is naturally of prime importance and after talking the matter over with some of the boys the 2A7 was chosen for the oscillator with the 56 to function as the detector. The unit was constructed and its performance exceeded all my expectations. The 2A7, after being allowed to settle, held the calibration error on the 14-Mc. band down to close to 1 kc., which is tol'able good. Along about April, 1934, someone brought out an improvement which, while not affecting the oscillator, afforded a cleaner keying signal; this was the tuned grid circuit on the detector.

Quite recently another article appeared in *QST* entitled "Audio Oscillator Keying Monitor Without Relays." Upon reading this an idea was born and is here presented as an improvement for the shack, with apologies to the fellows who provided the basic ideas.

It seemed to me that the 56, while doing a mighty fine job as a detector, could still be called upon to perform another duty, so by rearranging the grid circuit it is made to function as an audio oscillator which provides a beautiful signal for listening to that bug. For those who already have built and operated the frequency meter-monitor already referred to the changes, shown in Fig. 1, are simple and inexpensive. A d.p.d.t. switch, an old audio transformer, a volume control, couple of resistors and the change is completed. Following through the d.p.d.t. switch it will be seen that on one side the cathode resistor is grounded while the grid is connected to L_2 . The coil L_2 consists of 5 turns of No. 20 on a tube base, and without any tuning condenser resonates at around 14 Mc. well enough to provide an S9 'phone signal with the switch in the oscillator plate in the "Off" position; Voila, the Phone Monitor!

With the oscillator plate switch closed, the carrier or keyed transmitter signal can be tuned

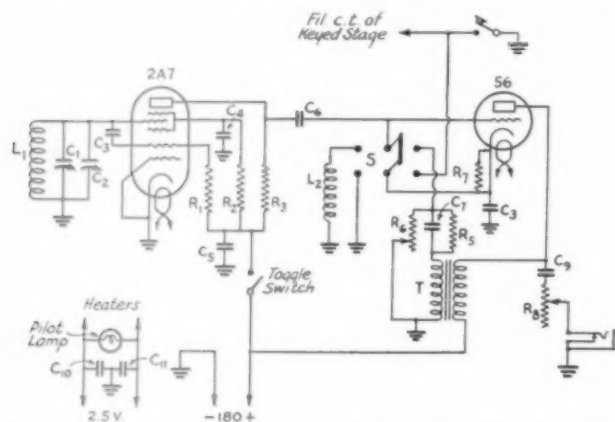


FIG. 1—COMBINED FREQUENCY METER, MONITOR, AUDIO OSCILLATOR

C_1 —25- μ fd. variable (bandspread).
 C_2 —50- μ fd. variable.
 C_3 —0.002 μ fd.
 C_4 —0.1 μ fd.
 C_5 —0.5 μ fd.
 C_6 —0.01 μ fd.
 C_7 —250 μ fd.
 C_8 —0.5 μ fd.
 C_9 —0.1 μ fd.
 C_{10}, C_{11} —0.004 μ fd.

R_1 —40,000-ohm.
 R_2 —100,000-ohm.
 R_3 —10,000-ohm.
 R_4, R_5 —0.5-megohm.
 R_6 —100,000-ohm variable.
 R_7 —15,000-ohm.
 R_8 —0.25-megohm.
 L_1 —Inductance adjusted for frequency band desired.
 T —Audio transformer.

of a brand-new five spot for a crystal guaranteed to hold the signal of VE2EE on a frequency of 14,398 kc.; the itch to ride the edge was upon me. Two A.R.R.L. Official Observers checked the signal at 14,403 kc. and sent me QSL's. Was my face red! At that time the station sported a monitor of the single tube type which up to that time had been considered sufficiently reliable, but with trouble sneaking up on me so unus-

in, by means of C_1 . *Ici* . . . the Frequency Meter! With the d.p.d.t. switch in the other direction the grid of the 56 is connected through the grid leak and condenser, R_5C_7 , and the audio transformer secondary to ground, while the cathode is connected through one wire to the center-tap of the keyed stage on the transmitter, above ground until the key or keying relay contacts are closed. The audio oscillator is thus keyed simultaneously with the transmitter. R_6 is front panel control of audio tone, and the pitch of the note can be varied for different ears between 300 and 5000 cycles. The volume control R_8 provides a means of controlling the volume of the oscillator without affecting the frequency; this is an essential as the level of the audio oscillator is up about 15 db over the output of the frequency meter. The toggle switch in the plate circuit of the 2A7 is necessary to prevent the r.f. oscillator signal from killing the audio oscillator, since C_6 is always in the circuit.

The 2A7 functions as a negative-resistance oscillator of the retarding-field type, with electron coupling to the output circuit. Its use was suggested to the writer by J. C. E. Mitchell, VE2LO. In the circuit shown, the Nos. 3 and 5 grids together as a plate, and the No. 4 grid as a suppressor. The screen and suppressor are at the same r.f. potential, and when the potentials of both vary together, increasing screen potential will be accompanied by decreasing screen current and vice versa, thus giving the negative-resistance effect.¹ The No. 1 grid is connected to the cathode. The circuit is simple to use, since no feedback tap or coil is needed.

Another Harmonic-Reducing Circuit

NOTICED much discussion in *QST* lately re harmonic radiation—or rather its elimination—and would like to chip in a few cents' worth as per the diagram of Fig. 2. Have found this circuit very effective with either self-excited or oscillator-amplifier rigs.

Circuit L_1C_1 is the regular tank circuit. L_2C_2 is tuned to the second harmonic, placed in lead from plate to L_1C_1 . It is essential that the coupling between L_1 and L_2 can be varied.

The rig is cranked up on the regular frequency and L_2 coupled fairly closely. C_2 is varied while listening to the second harmonic of the signal in the receiver. When the point of minimum signal is observed, leave C_2 at that setting and vary the coupling between L_1 and L_2 . This should still further reduce the strength of the harmonic when the proper degree of coupling is obtained. The antenna may be coupled by any of the usual methods; if an antenna tank is used, it should be coupled to the side of the tank circuit opposite

L_2 . L_2 , incidentally, probably works best coupled to the plate end of L_1 . I have reduced an S9 second harmonic to S3 by this method with no trouble to speak of. L_2 could be left fixed over a

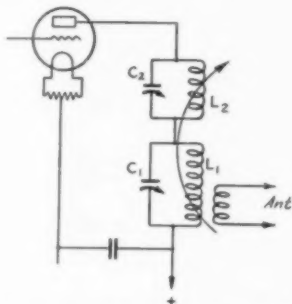


FIG. 2—COMBINED TRAP AND BUCKING CIRCUIT FOR HARMONIC REDUCTION

band once the optimum setting is found, but it would of course be necessary to retune C_2 for each change of frequency as its adjustment is quite critical.

—Fred C. Allen, VE3SA

Inexpensive Stage Switching

THE idea shown in Fig. 3 comes from Dr. W. R. Jaffrey, VE3DC, of Hamilton, Ont. Applied to the exciter unit described in October *QST*,² it substitutes a 6-prong tube socket for the switch, and utilizes old tube bases with appropriate

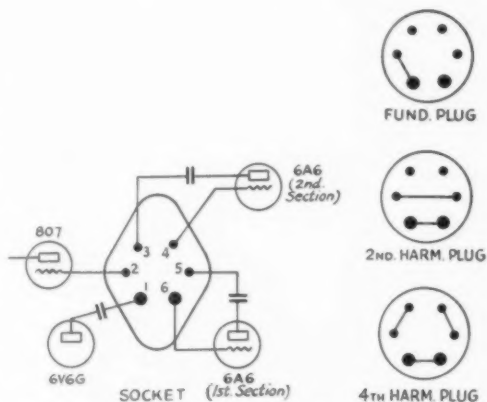


FIG. 3—STAGESWITCHING SYSTEM USING A TUBE SOCKET AND TUBE-BASE PLUGS

ate jumpers between the pins to make the proper connections between stages for output on various bands. The socket may be mounted on the front of the unit, in case relay-rack construction is used, so that it is readily accessible. Other pin

¹"A New Type of Two-Terminal Oscillator Circuit," *QST*, April, 1935.

²Grammer, "A Semi-Universal Exciter with Stage Switching and Plug-In Coils," *QST*, October, 1937.

connection arrangements can of course be used provided the necessary interconnections are made with the three plugs.

With the 6-prong socket shown, the grids of the idle stages are not grounded as in the original switching arrangement. Grounds can readily be provided, however, by using a 7-prong socket and plugs, using the seventh prong as a ground with appropriate connections in the plugs.

VE3DC also recommends using a 0.01- μ fd. 600-volt condenser connected between oscillator cathode and ground if the oscillator is keyed in the cathode circuit. A choke between key and ground is also helpful in preventing chirp with oscillator keying.

Replacing Magnetic Speaker with D.C. Dynamic

FIG. 4 shows a simple method of replacing the old magnetic speaker with a dynamic without adding a field supply or without modifying the receiver in any way. The field is simply connected

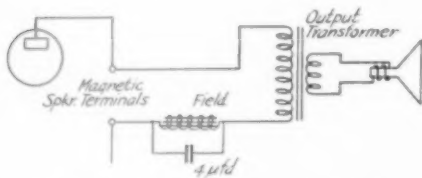


FIG. 4—USING A D.C. FIELD TYPE DYNAMIC SPEAKER ON SETS BUILT FOR MAGNETIC SPEAKERS

in series with the primary of the output transformer and by-passed with a 4- μ fd. condenser, thus using the plate current to the output tube of the receiver to excite the field.

—C. W. Leeds, Jr., W3AIU

Regenerative Doubler

THE output of the 46 doubler in the 47-46-10 low-power transmitter, shown in August, 1936, *QST* and the Fourteenth Edition of the *Handbook*, can be materially increased by the use of the regenerative circuit shown in Fig. 5. All that is required is a trimmer condenser and a few turns of small wire. The use of a separate neutralizing coil connected as shown permits the use of a cheap trimmer condenser instead of a more expensive variable which would be necessary if the plate voltage appeared across it. In some cases an increase of 100% has been obtained in the grid current of the 10 when used as a doubler. At the same time the plate current of the 46 was lowered by one third. The addition of the neutralizing coil requires no changes in any existing connections. L_n has the same number of turns as

L_2 , and is wound one-eighth inch away from the low-potential end of L_2 . No. 30 wire is plenty

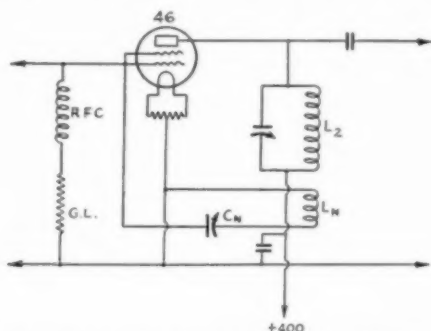


FIG. 5—ADDING REGENERATION (NEUTRALIZATION) TO A DOUBLER STAGE

large enough. The circuit is neutralized in the usual way.

—H. E. Preston, W8CSE

Mounting Trimmer Condensers

WHILE rebuilding recently, I decided to mount the grid tuning condensers inside the coil forms (link-coupled circuits) to save space. To eliminate loose wires inside the coils I ran across this very helpful kink which saves plenty of time and trouble.

Instead of using the usual 4- or 5-prong coil form, I purchased the six-prong type (some of

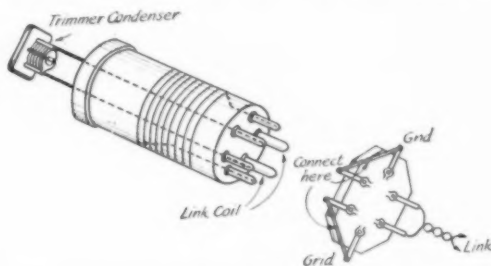


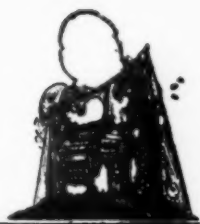
FIG. 6—WIRING ARRANGEMENT FOR EASY REMOVAL OF TRIMMER CONDENSERS MOUNTED IN COIL FORM

these have a mounting shoulder for mica or air trimmers). Hook the twisted pair for the link to the large terminals, and the ends of the grid coil winding to plate and cathode prongs. This leaves the two top prongs free for connection to the tuning condenser. The connections may be pulled tight and cut off, as indicated in Fig. 6. This permits easy removal or installation of the tuning condenser. Connections between the condenser and the two sides of the grid coil are made on socket. Don't forget these!

—R. N. "Bob" Eubank, W3WS (W3AAJ)



Amateur Radio STATIONS



W6HG, Inglewood, Calif.

NOT all West Coasters employ "California kilowatts." In twelve years' operation George Dery, W6HG, ex-6CHT, has used single-210 transmitters. (Before the 210 it was a single 202.) The photo of W6HG shows how ultra-simple an amateur station can be, yet it can be just as effective as it is simple. With the 210 Hartley, running only 40 watts input, WAC has been made on 14 Mc., and all continents except Europe have been worked on 7 Mc. The receiver is an SW-3. Crystal control was used for a period of about a year, but eventually was discarded in favor of the greater flexibility of the self-excited rig. Favorite antennas are a 67-foot horizontal Zepp for 7 Mc. and a 31-foot vertical for 14 Mc.

The operator, an ex-seagoing brass-pounder, gets his fun working DX and handling traffic with foreign stations. Despite the low power, W6HG is a member of the Trans-Pacific Traffic Association.

W5FIY, Okemah, Okla.

W5FIY, John F. Stanbery, of Okemah, Okla., specializes in low-power 'phone DX, the 14-Mc. band being his principal hunting ground. After an eight-months' wait to get Africa WAC was finally made in June, all contacts being made with a pair of 841's running only 60 watts input. Since then the 841's have been replaced by T-20's.



W6HG

The tube line-up in the transmitter consists of a 6L6 crystal oscillator, doubling, an RK-39 buffer and second-doubler, and the aforementioned T-20's. The input has now been increased to 90 watts. The final is modulated by a pair of Class-B 46's. The microphone is a Shure 70S crystal. A three-halves wave antenna, fed



W5FIY

through "Q" bars, is used. It is 55 feet high.

A Lincoln R-9 communications-type receiver is used. Other equipment on the operating table includes a Peak pre-selector, control panel and speech amplifier, monitor, and a frequency-meter.

W5FIY was formerly W4DPI in Tennessee, where he secured his first license in 1935. At the present location, nearly all operation has been on 20-meter 'phone, although 75 is used occasionally.

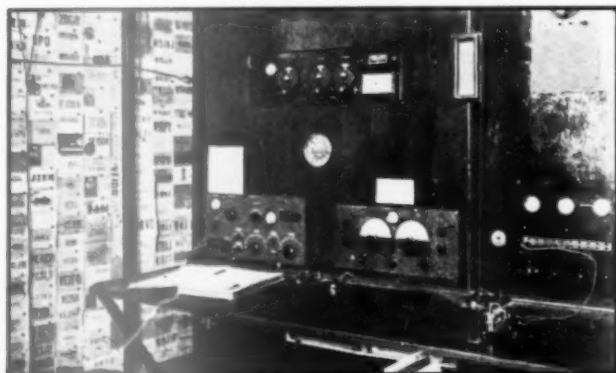
K5AA, Fort Amador, Canal Zone

THE inhabitants of the c.w. portion of the 14-Mc. band between 14,250 and 14,400 kc. can recognize after a dot or two that signal near 14,300. There's something about the note and the operating which makes K5AA one of the most easily-spotted stations on the band.

The photograph shows most of the equipment that is visible from the operating position. Everything is behind a series of plywood panels, totalling 8 by 10 feet, from which a shelf extends out to serve as the operating desk. Even the receivers are

set flush, as the photograph shows. A small shelf under the table holds the log and callbook.

The transmitter is operated on 14,310 kc. only. Starting out from an 80-meter crystal, the tube line-up includes a 59 Tri-tet oscillator, a pair of 10's, a 211 doubler-buffer, and push-pull 860's in the final amplifier. Grid keying is used, with 42's as the keyer tubes. Power switches are on the



K5AA

control panel at the right in the photograph.

For ham work, the receiver used is an RME-69. The receiver to the left of the 69 is a late-model army set, while a second army receiver of older vintage is mounted up above.

There are seven operators at K5AA: Turcotte (Eddie); Templin (Dick); Laird; Winters (Ed); Atwill (Bill); Weir (Chas.), and Klami. Schedules are maintained with several W stations, and the whole gang likes rag-chewing. And they have a signal with which they can put it over.

K7EVM, Fort Yukon, Alaska

WHEN you're out in the far-away places, amateur radio assumes greater importance than simply a hobby, important though our hobbies may be to us. In such a case, a little thing like lack of power may be an annoyance, but it is not a major obstacle.

K7EVM, owned by Ray Randall, Deputy U. S. Marshall and Deputy Collector of Customs at Fort Yukon, Alaska, is such a station. First take a look at the picture which shows the location, and then read the following letter:

"The shelves which hold the transmitters are mounted on the outside wall, which is of logs. This is fairly solid. In the upper right-hand corner there is a single 42 crystal transmitter connected Tri-tet. I usually use this on 80 meters, though have tried it out on 40 and 20. The greatest DX on 20 with this rig has been a contact with F8EO.

"On the upper shelf along with this rig there is

also a Collins type pi-filter. Notwithstanding all the adverse criticism of the filters I find it very satisfactory and so far have had no ticket for harmonic interference, nor any heard cards on 10 meters!

"Below, the 47-46-p.p. 46's are spread out, and on the bottom shelf are the power supplies. There are three, 300 volts for the oscillator, 400 volts for the doubler and 550 volts for the final. Condenser input on the low supply and choke input on the others. Rectifiers are an 80, 5Z3 and an 83.

"The receiver at the left of the crystal Comet Pro is a home-built t.r.f. using 2-volt tubes. The frame and some of the parts are from an old Pilot Wasp. The coils are an old set of Nationals from a converter. The Comet is a 6-volt job with four Edison batteries for filament supply. These are located in a small lean-to addition at the rear of the house with a pair of wires running around the outside to the receiver.

"The stack of 'B' batteries to the right are for the 42 transmitter and are mostly old ones that have been used on the Comet until the voltage drops to about 35. The current drain on the 42 is low so I get long life from them. The neighbors give me their old batteries, which helps out a lot.

"I have a single-cylinder air-cooled engine



K7EVM

which drives a 32-volt generator to recharge the Edisons, charging in series and discharging in parallel. The engine also drives an a.c. generator made from an old Dodge generator. The generators are arranged so that either can be used. The engine is mounted on heavy timbers set on the ground, which is not very solid in the summer but in the winter I pour a little water around and it stays frozen all winter with the rigidity of con-

(Continued on page 116)

• I. A. R. U. NEWS •

Devoted to the interests and activities of the INTERNATIONAL AMATEUR RADIO UNION

Headquarters Society: THE AMERICAN RADIO RELAY LEAGUE, West Hartford, Conn.

MEMBER SOCIETIES

American Radio Relay League
Associazione Radiotecnica Italiana
Canadian Section A.R.R.L.
Českoslovenští Amatéri Vysílací
Deutscher Amateur Sende-und-Empfangs
Dienst
Experimenterende Danske Radioamatører
Irish Radio Transmitters Society
日本アマチュア無線連盟 Japan
Liga Colombiana de Radio Aficionados
Liga Mexicana de Radio Experimentadores

Magyar Rövidhullámú Amatőrök Országos
Egyesülete
Nederlandse Vereniging voor Interna-
tionaal Radioamateurisme
Nederlandsch-Indische Vereniging Voor
International Radioamateurisme
Newfoundland Amateur Radio Association
New Zealand Association of Radio Trans-
mitters
Norsk Radio Relæ Liga
Österreichischer Versuchssenderverband
Polski Związek Krotkofalowcow

Radio Club Venezolano
Radio Society of Great Britain
Rede dos Emissores Portugueses
Reseau Belge
Reseau des Emetteurs Français
South African Radio Relay League
Suomen Radioamatööriyhdistys r.y.
Sveriges Sandareamatörer
Unión de Radioemisoras Españolas
Union Schweiz Kurzwellen Amateure
Wireless Institute of Australia

Conducted by Byron Goodman

Regulations:

The right to use 'phone on 14 Mc. has at last been granted ZL stations, according to information received from ZLAAO through W6ITH.

The new regulations provide for a band from 14,150 to 14,250 kc. for 'phone, to be used between midnight and 7 A.M. New Zealand time. Crystal control must be used, with a buffer stage between oscillator and final. Equipment to indicate overmodulation, a monitor and a frequency meter must be included. All testing must be done with a dummy antenna. Applications for the use of 14-Mc. 'phone must be passed by both the N.Z.A.R.T. and the Postmaster General's office.

In Australia a circular letter has been sent to all licensed "experimenters" (i.e., amateurs), notifying them that because of abuses in operating practices, especially on 'phone and notably in connection with music testing, regulations were being placed in effect which (1) prohibit music transmission on 7 and 14 Mc., except during daytime between 8:00 A.M. and 5:00 P.M., (2) impose technical requirements concerning oscillator stability and modulation efficiency on the operation of 'phone stations, (3) limit 'phone transmitters to 25 watts input power, (4) institute a probationary period of six months in which c.w. operation with power under 25 watts only is permitted, and (5) announce that vigilance committees are being appointed in each state to assist in securing enforcement of regulations.

QSL:

As most readers will have realized, the Australian QSL Bureau listing in the October issue

was in error. The address given applies to Austria. The Australian address is: W.I.A., QSL Bureau, Ray Jones, 23 Landale St., Boxhill, Victoria.

WAC:

The following WAC certificates were issued during the period from January 1 through June 30, 1937:

Dorothy D. Hall, W2IXY ('phone); Francois Peret, F8II ('phone); S. C. Pleass, ZT6K; Perce Cronin, ZL20Q; J. W. Mavis, ZE1JE; J. P. R. Friedenthal, ZS6AJ; Kristian Mathiesen, LA3H; Ernst Schamann, D3CFH; R. T. Dealey, G6DT; Harushige Nakano, J3FT; Erling Karlsen Klevfos, LA5B; Andreas Giske, LA5Q; Wilh. Ingart, LA4R; F. E. A. A. Koopmans, PAØTSK; Frank A. Robb, G16TK; D. H. Wijkman, PAØIDW; Victor Bollart, ON4DOA; Leonard E. Drossel, W6CDX; Wladimir de Carvalho, PY2BX; E. R. Roderick, W8MWL; E. V. Carpenter, W8KSF; Dr. H. G. Wyer, W1ICI; W. L. King, W7ETK; Fred J. Follett, W7NS; H. M. Grant, W9HHQ; Maury Kingman, W3FGG; Wm. L. Opdyke, W3VB; R. C. H. Taylor, ZT6T; L. Adalberto Brito, R., CE4AD; Arthur B. Smyly, W9GIZ; C. M. Fockler, VE3KF; Wenceslao Séré, CX1AA; San Jose State Radio Club, Harry Engwicht, Trustee, W6YL; Donald J. Simpson, W3EYF; Walter J. Smith, Jr., W2DXO; Norman P. Jessup, W5EHR; Richard F. Barrett, W6CFK; Roy W. McCarty, W9BA; Mrs. Mary Roth, W9TSV; Murray J. Douglas, W6CUG; Theodore J. Zuk, W1GUL; David B. Stout, W3UX; George D. Heitzman, W7AHX; Kiyoshi Yamachika, W6NGO; Raymond C. Lowery, W1AFB; Elmer Rahmes, WSJFC; Andrew C.

Thompson, W8DQN ('phone); George W. Korper, Jr., W2HMD ('phone); O. A. F. Spindler, VU7FY ('phone); F. Moureaux, ON4DM ('phone); Reber M. Bell, W8JVF ('phone); C. C. Brown, W7EXK ('phone); Franklin H. Huyette, W7ALZ ('phone); Leonard B. Foz, CO7CX ('phone); R. P. Nick, W3LN ('phone); T. J. Morgavi, W5FMO; E. Valentin Granqvist, OH3NP; A. S. Wood, G5WT; J. Paine, G6PR; Friedrich Boch, D4BFU; F. B. English, G6AZ; John Oxley, G6QP; R. P. Walker-Alexander, VS7RA; Lars R. Heyerdahl, LA6A; Sven Conning, SM6SS; Ernst Kammeyer, D4KRJ; Emil Rostgaard, OZ5R; J. J. Berthelsen, OZ8JB; William M. Wood, W9MLF; B. H. Stevenson, W2BXA; William F. Sanders, W7DAA; Thomas O. Tyner, Jr., W4BWZ; Lloyd J. Perper, W2HSD; Hugh H. Waesche, K6MXM; Thomas P. Robertson, W4TJ; Archibald W. Paull, Jr., W8FVU; Henry E. Wagner, W3FIA; Lewis L. Wilhelm, W6NGD; John F. De Jonge, W2GOM; Leonard J. Nole, W2FKL; Hayes Acton, W6NIK; Ellis R. Curry, W4BSJ; Don McVicar, VE4PH; Archie McCallister, W8IQB; Percy H. Foley, VE3ADM; Dr. I. Antalfy, HAF4H; E. A. Andress, W6KUT; Lieut. Clarence Herbert, W1HJ; Marcus M. Sullivan, W8BIX; Peter Wiltjer, W8MTF; Robert W. Stark, VE4FT; Leif Johnson, W7EUY; William G. Streater, W7BMT; Dwight B. Sprow, W9ULJ; Paul M. Lawman, W8MZD; William E. Lucey, W9SQL; Edmund C. Harry, W8LYQ; William L. May, W3APJ; Jesse D. Meadath, W3GMS; R. Christianson, SM7YA; J. P. R. Friedenthal, ZA6AJ ('phone); Henry B. Lockwood, W2HFS ('phone); Carroll D. Kentner, W3ZX ('phone); Dr. John T. Porter, W5AKZ ('phone); Clarke Paige, W1CGY ('phone); Oliver W. Ford, W1FVO ('phone); Fred H. Hartley, W3MD ('phone); Hansford D. Scott, W9NGZ ('phone); Harold G. Palin, W9YGC ('phone); George Moens, SU1RO ('phone); Fenton F. Priest, Jr., W3EMM ('phone); Lew I. Stoner, W8IMS ('phone); Pippo Fontana, I1TKM ('phone); Pippo Fontana, IIAY; Fausto Luise, I1BS; Harold Smith, W2GKE; D. H. Duff, VK3EO; R. Weeden, VK2PN; R. Tandy, VK3KX; K. Heitsch, VK3HK; R. E. Sankey, VK3XP; D. C. Dunn, VK2EG; B. L. Dimmock, VK2OW; L. G. Young, VK3JN; G. A. Greenhill, VK4LE; L. C. Meyers, VK2KS; A. H. Mackenzie, VK4GK; H. C. Dicks, ZU6AF; T. F. Starek, ZT6AY; Reginald George Henwick, ZT2Q; Florian Bossel, HB9BN; Heinrich Degler, HB9A; E. A. Bultemann, D4QNM; G. de Borchgrave, ON4ID; J. Leblanc, ON4JO; A. Berthet, ON4RAY; F. W. Baptista, ON4AS; Bohumil Zeman, OK1ZB; Oldrich Pospisil, OK2PN; Adolf Klemes, OK1KA; Frantisek Dolezilek, OK2DF; E. Ingleton, G5IL; A. E. Lambourne, G5AO; George Curran, G2KY; C. W. Thayne, G2UT; H. J. Merriman, G6GM; W. H. Van der Meulen, PA0MG; H. A. Touw, PA0ZB; J. J. v.d. Hoek, PA0JV; Andre Caillot, F8QY; Henri Didier,

F8FK; R. E. Robinson, ZL4AC; W. E. F. Mickelborough, ZL1BC; Julian W. Scrivener, W3EX1; Sergt. Frank W. Skinner, SU1FS; Charles A. Pine, W9CWW; Carl W. Krueger, W8NKK; John M. Seidel, Jr., W8OMQ; Malcolm J. Stevens, W8IWG; Frederick Weyerhaeuser, W9YPQ; M. A. Webb, W5FIO; Bennett R. Adams, Jr., W4APU; Italo Corsi Lazzeri, PY2CW; Leo M. Schrader, W8IOT; Eladio L. Licaucio, KA1EL; Harold J. Klaiss, W4QN; N. F. McCarthy, W1CUO; Richard J. Lawton, W6MVQ; Walter S. Ellis, W6CVW; Francois C. B. Jordan, W3FIU; C. B. Dowden, VE1HK; Mrs. E. C. Hamilton, W9OWQ; James A. Wilson, K5AY; William W. Lamb, W8CXR; William E. Leeder, W8MFB; Edward J. Delaney, W2FGG; Melvin Z. Vickers, W8IUS; H. Bernhardt, LY1HB; Dr. Felipe Santiviago, ZP2AC; Susano Jalnada, CX1BG; Woodrow W. Guile, W1EBO; J. Harold Humbrook, W6BUO; John W. Russell, W5ACD; Edward Hazen, W6MZH; C. P. Sweeny, W2DXX; Vicent I. Kraft, W7EHL; Hector Soula, LUSEN ('phone); Roland Guy, F8YG; Roland Guy, F8YG ('phone); Heinrich Degler, HB9A ('phone); V. Plascott, G5PT ('phone); E. D. Kellogg, W7MD ('phone); Clarence C. Margerum, W1AQM ('phone); Don C. Wallace, W6AM ('phone); D. M. Heath, W4BMR ('phone); Frank H. Altdorfer, W3APO ('phone); Dr. Elmer G. King, W6CQG ('phone); Thomas A. Archer, VP6YB ('phone); J. Butcher, G5XG ('phone); H. A. M. Whyte, G6WY ('phone); W. Vuyk, PA0WV ('phone); G. Brockmann, D3ANK; Archduke Anton Habsburg, OE3AH; H. H. Hemminga, PA0HC; R. W. Rogers, G6YR; D. J. van Straaten, PA0EC; Emil Linscheid, D3GRH; I. C. van Sonsbeek, PA0KV; E. R. Martin, G6MN; Bertil Arvidson, SM5RH; Malcolm Shaw, G6OF; I. S. Doktorits, HA8D; S. Partington, G2GQ; R. Van Steenkiste, ON4SK; Dr. Maurice Polain, ON4CM; Fernand Delbrouck, ON4LB; Ulrich Jaeckh, D3IQH; Werner Bretschneider, D3DBN; Lawrence Nelson, W9MCC; Cecil T. Marshall, W5FDD; A. G. Brewer, VE3DA; Robert H. Meyer, W6LPC; William Tinsley, W9VDD; Jacob W. Schott, W8FGX; P. W. Lister, W8ISC; John T. Chambers, W6NLZ; Bill Case, W5FNA; Edward S. Onouye, K6HZI; John C. Hays, K5AC; Carl L. Hansen, W9CUH; Hugon Gildner, SP1DU; Clifford Cavanaugh, W7ACF; Bernard J. Biscioti, W3FLH; George C. Wallace, W8ENA; Raymond F. Rinaudo, W6KEV; Hunley E. Thomas, W7FEZ; William J. North, W8NP; Harry R. Whiting, W2JXH; Mareel Jerzy Fluhr, SP1FL; Piotr Sliwiak, SP1AH; Eugene T. Butt, W5BSF; Bruno Staffen, W9HFK; DeAlva C. Summerford, W9AYH; Arthur F. Hasbrook, W5BWM; Frank F. Griffin, VE4KF; L. B. Farvour, W9TJI; Blair Benson, W1IGR; Bill Orr, W2HCE ('phone); Norman L. H. Platt, G5PB

(Continued on page 124)



OPERATING NEWS



Conducted by the Communications Department

F. E. Handy, Communications Manager

E. L. Battey, Asst. Communications Manager

For A.R.R.L.'s Tenth International DX Competition tentative dates are announced: Radiotelegraph contest, March 5th to 13th. Radiotelephone contest, March 19th to 27th.

Any changes in our DX Contest rules? But two out of many suggestions seem to meet general approval. (1) "Operating time" recorded as the summation of the difference between "time on" and "time off" will probably be required reported in units of *full hours* covering full quarter-hour segments rather than making up total time as the sum of many shorter periods. Five minutes' work or fifty-five minutes' or sixty minutes' work will all count as an hour. Work may be planned to permit periods on and off the air to suit vocational schedules, but dipping in and out of the fray for just quarter-hour periods may prove unprofitable.

(2) A group of radiotelephone amateurs request change in 'phone rules to bar counting any contacts by 'phone with telegraph stations . . . requiring all work reported to be "voice to voice." That's OK with us if the gang really want it that way, and unless strong opposition is voiced at an early date that's the way the rules will appear. It may limit scores slightly, but, like all rules, they are equally fair to all comers. There are a few foreign countries where telegraph stations can be worked, but few or no voice stations. It was our idea to give everybody a crack at these—but the factor is unimportant as long as the rules are the same for everybody. So expect it to be a 100% voice-only telephone competition.

(3) Remember the disqualifications made last March for off-frequency operation, improperly modulated notes, and the like? Violations of government regulations will again be penalized. There must be no repercussions about poor amateur operating at Cairo! Official Observers will be asked to hew to the line, reporting all violations to the contest committee. Special cooperation is being requested of the F.C.C. itself. We shall ask the monitoring stations to give the DX bands redoubled attention. Any stations known to have been logged in violations by the F.C.C. during the contest will also be disqualified automatically. The interest of *all* amateurs requires strict observance of frequencies, d.e. power supply regulations, etc.

A.R.R.L. Member Party Coming!! A number of A.R.R.L. activities are open to all radio amateurs, whether members of the League or not. Appointments by S.C.M.s are, in accordance with the League's By-Laws, open *only* to *bona fide* members of the League. Appointees have special tests at regular intervals. January 8th-9th week-end has been proposed for a special activity, A QSO PARTY FOR A.R.R.L. MEMBERS O N L Y. For maximum enjoyment for our members, rules will be of the simplest—no restrictions to certain bands—nor to 'phone or telegraphy. Either or both may be used. A worthwhile prize will be given by A.R.R.L. to the MEMBER in each Section who can chat with most other members in the allotted hours. It will be something designed for the individual member himself. Details next month. Set aside the dates. Polish up the station. Any persons who are League Members on January 15th will be eligible to the fun and benefits—but not other amateurs.

Friday, December 10th—A.R.R.L. Copying Bee. Let us check your copy and return to you for your confidential information. See announcement on page 16.

—F. E. H.

Official 'Phone Station and Official Relay Station appointees have entered on another all-season competition which runs to May 15, 1938. In each group, amateur work performed *between* the dates of the quarterly station tests that keep these stations and operators at peak efficiency, will count an important part in the results of all the stations. This season not only national standings but section comparisons will net points to participants. Experimental and constructional activity is emphasized in the radiotelephone group, and traffic handling in the O.R.S. group. These key appointments stand for the best in amateur operating. The submitted performance records will enable the judges to select the best all-around O.P.S. and O.R.S. for the seven-month period ending next May. Ten awards will be made in each group.

Regular Headquarters bulletins to these organized 'phone and telegraph groups convey full details on rules and prizes. Any League member-amateur who can qualify by consistent activity, proper procedure and operating ethics, a good

station and monthly proof of doing things with it, is eligible for appointment as O.R.S. or O.P.S. Drop Hq. a line stating whether you are interested in voice or telegraph appointment and let us send you information about the qualifications. The appointments are not made by Headquarters but by the Section Communications Manager elected by League members in each Section. Your S.C.M. is listed on page 4 of this issue and he will send ORS/OPS application blanks on request.

The exclusive DX Century Club membership is growing. 75-country men are in a scramble to secure the elusive written proof and make the full membership. Others are working for 75 countries! It would be trite to say that DX is "popular as ever" this year. DX tales have acquired about the reputation of "fish stories." Now we have a club with certified members, all of whom successfully meet the dual challenge of the I.A.R.U. country list, and the hurdle that comes in getting the written confirmations which is a legitimate requirement. Our membership list is no empty list of fishermen who say what they have done, but a list of those who have proved their right! Hats off to the "centurions."

The A.R.R.L. Trunk Lines (each of the fourteen lines supervised by one of its members) set our pace in organization performance this year. Functioning with snap and precision these lines have outlets and inlets for handling traffic to and from an increasing number of A.R.R.L. Section Nets. Official appointment to posts of responsibility in the system arranged above is effected by certificate. The certificates are striking and to the point. The definite performance for amateur radio is likewise much in point. We want to say that every amateur, whether he takes part in this worthwhile relaying work or not can be proud of the work Official Relay Stations and nets are doing. The men who hold certificates have earned them well. They invite all amateurs (and others) to route traffic over their routes. To reach the friend who is beyond immediate range of transmitter, or unavailable at convenient hours, to schedule us the intelligent way is to use amateur message facilities.

—F. E. H.

Brief

In regard to the letter in the correspondence section of October *QST* concerning special telephone directory listings for amateur radio stations, additional information has been received. Directory listings are not determined by the A.T. & T. but rather by the local telephone company which furnishes the service and publishes the directory. Most local companies charge a nominal sum (usually 25¢ or 50¢) for additional directory listings. The West Virginia company mentioned in October *QST* is an exception, offering free listings for amateur stations. If you desire your station to be listed in your directory, get in touch with your local telephone office for information on the cost, etc.

PRIZES FOR BEST ARTICLES

The article by Mr. Joseph A. Hoffmann, W2DIJ, wins the C.D. article contest prize this month. Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX, 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1938 bound *Handbook*, *QST* Binder and League Emblem, six logs, eight pads radiogram blanks, DX Map and three pads, or any other combination of A.R.R.L. supplies of equivalent value. Try your luck. Send your contribution to-day!

Effective Use of CQ

By Joseph A. Hoffmann, W2DIJ*

CQ calls are an important part of amateur operating, and probably the most misused part. It is essential that every amateur acquaint himself with and make use of the correct CQ practices in order to obtain more and better QSO's.

Many operators having only a little time to spend on the air will turn on the rig, and after a quick tune-up and check-up on the meters while the key is "locked" will turn on the receiver and proceed with a CQ, continuing it long enough for the receiver to get thoroughly warmed up. When they start listening for an answer they will be surprised at the number of CQ's and other QRM on the band. Such foolish operating just adds its bit to the unnecessary QRM.

Before calling CQ we should tune over the band thoroughly to see if any CQ's are being sent, and if there are, why not answer one of them? Our own CQ will probably be answered by one of those same stations anyway. While listening over the band we may run across some good DX. If no DX is heard and conditions seem unfavorable for DX, there is no reason for calling CQ DX as is often heard called at the most inopportune times. During our listening periods prior to calling CQ we may hear only "locals," and if we are looking for QSO's with stations somewhat remote, it is useless to call CQ at this time as is also the case when skip prevents us from hearing "locals" when we want such QSO's. Better results are usually obtained by listening for certain places than by calling directional CQ's. A good listener can sometimes distinguish DX and certain sections of the country by the tone of the signals and the type of sending. If we still persist in CQing after doing these things, we should first listen on our own frequency to ascertain whether it is free from CQ's and also wait for QRM to abate somewhat to insure being heard.

At times we will notice several stations on the band all calling the same fellow. A good time to CQ is right after they stop calling that fellow, as probably all of them except the lucky one will be back listening for more CQ's. Many times fellow calling CQ is answered by several stations, but due to an obsolete or faulty receiver he hears not one of them and calls CQ a second and third time with the same lack of results. Not giving his receiver a thought he tries returning the rig for the next few minutes causing awful QRM. He then tries CQing again with no luck, decides conditions are against him and QRT's. If your receiver is N.G., refrain from CQing, and call only those you are able to hear.

CQ, CQ, 21, 22, 23, and we turn our dial to another frequency in disgust. It is nothing unusual to hear twenty or more consecutive CQ's before an interruption is made by slurring in the call letters once or twice, and then this whole procedure repeated a few times before the CQ is finished up with almost anything but K to indicate that the operator is ready to listen over the band. Incidentally it has been men-

*57 Grandview Ave., White Plains, N. Y.

tioned numerous times that three CQ's followed by the call letters once or twice, and this procedure repeated three to five times followed by the signing of the call letters several times and then sending K is sufficient for obtaining excellent results. It is of extreme importance to sign the call letters several times at the end before signing K, as the CQ is easily identified through QRM and may be heard at some distant point, whereas the unfamiliar call letters need several repeats if you want to be identified correctly. It is very helpful to the listener if you indicate which part of the band you are tuning from by sending QHM, QML, etc., at the end of your CQ. (QLM: low freq. to middle; QML: middle to low freq.; QHM: high freq. to middle; QMH: middle to high freq.)

Remember, the faster you send, the smaller the group becomes that will be able to receive you. Avoid causing guesswork on the part of the listener by sending your call letters distinctly and free from any peculiar keying rhythm known as a certain kind of swing. The listener usually forms an opinion of a fellow's sending by the CQ he hears. Since this is true, many operators send a snappy, errorless CQ to impress those listening and thereby hope to receive more answers. Many times this impression lasts but momentarily, as the CQer breaks down into his usual sloppy fist in the second transmission, and the answerer is greatly disappointed.

When answering a CQ it is necessary to know the condition of the band regarding QRM. A quick look over the band now and then while operating will suffice. Some fellows make the mistake of calling stations the same length of time in the daytime as in the evening when the band is very crowded. It takes quite a while longer to tune over a crowded band, so make the calls according to conditions, and of course they will vary in length dependent upon the part of the band the CQer is tuning from. Stations located on the edge of the band should give a short call, sign, and then listen, and if the CQer fails to answer, continue with a longer call now as the CQer is probably looking over the band for other calls, one of which he will pick out for a QSO. Break-in should also be used when answering CQ's.

A fellow with an r.a.c. note occupying 75 kilocycles of amateur band was heard rag chewing the other day. When a fellow with a bad note is heard CQing, it is our immediate duty to call him and tell him to change it or keep it off the air until it is fixed. The same thing applies when we are called by a bad note. It is hoped that the practices suggested in this article will be conspicuous by their greater and constant use on the air rather than by the space they take up on this page.

Let's improve our operating by the effective use of CQ.

56-Mc. International Contest

THE Radio Society of Great Britain announces a 56-Mc. International Contest.

The rules are as follows:

1. The Contest starts January 1, 1938, and concludes December 31, 1938.

2. The Contest is open to any radio amateur licensed to operate in the 56-60 Mc. band.

3. The winner will be the operator of the station scoring the most points based on the following system:

1 Point for each contact over a distance between 200 and 1000 Miles; 5 Points between 1001 and 2000 Miles; 10 Points between 2001 and 3000 Miles; 15 Points between 3001 and 4000 Miles; 20 Points between 4001 and 5000 Miles; and so on, at the rate of 5 extra points for each additional 1000 Miles or part thereof. All distances to be calculated by Great Circle. To count for points the Readability, Strength and Tone (both incoming and outgoing), must be logged, together with Date, Time and Call Sign.

4. In addition, and in order to collect current data, each contestant must send to the Radio Society of Great Britain, a monthly report of stations heard and/or worked, together with notes concerning conditions, power used for contacts, etc.

5. The R.S.G.B. will present a suitable Trophy to the

BRASS POUNDERS' LEAGUE

(September 16th-October 15th)

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
W6ITH*	97	312	281	296	986
W4PL	12	29	874	9	924
W6JTV	112	267	219	204	802
W8MOT	365	15	314	12	706
W8IOX	17	59	614	14	704
W8HCS	37	180	362	102	681
W4IR	40	97	434	73	644
W9ESA	58	95	414	73	640
W1AKS	120	127	330	—	577
W6LLW	15	31	496	4	546
W8OFO	33	16	472	24	545
W2BCX	15	12	512	—	539
W3SN	104	157	271	—	532

MORE-THAN-ONE-OPERATOR STATIONS

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
K6OGD	244	226	1464	125	2059
W5OW	164	371	676	129	1340
W9BNT	153	255	564	—	972

These stations "make" the B.P.L. with total of 500 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count!

W6BQO, 264	W6IMI, 177	W6LBB, 117
W3CIZ, 216	W3QIP, 166	W9VDQ, 110
W5FSK, 204	W2JWT, 148	W1JMY, 103
	W9LEZ, 132	

A.A.R.S.

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
WLMI (W6GXM)	67	141	434	—	642
WLMA (W8YA)	26	6	550	2	584
WLNF (W2BCX)	2	12	498	—	512

WLTK (W9KJY) and WLNK (W2DBQ) made the B.P.L. on 200 and 113 message deliveries respectively.

MORE-THAN-ONE-OPERATOR STATIONS

Call	Orig.	Del.	Rel.	Extra Del. Credit	Total
WLM (W3CXL)	209	169	1344	—	1722

A total of 500 or more, or 100 deliveries Ex. D. Cr. will put you in line for a place in the B.P.L.

* All traffic handled by two-way radiotelephone.

winner, whilst certificates of merit will be awarded to the leading station or stations in each country.

6. No entrant may employ Interrupted Continuous Waves, Modulated Continuous Waves, Telephony, or any other form of modulated carrier, for contacts claimed in this Contest.

7. At the time of the contact both stations must be operating on 56 Mc. from their fixed station addresses.

8. Only one contact with a specific station may count for points in any 7 Day period.

9. Entrants must adhere to the terms of their licence.

10. Final entries must be received by R.S.G.B., 63 Victoria Street, S.W. 1, not later than February 28, 1939. (W and VE entrants may send their entries via A.R.R.L.)

11. The decision of the Council of the R.S.G.B. shall be final in all matters relating to the Contest.

Attention is called to the cup award being offered by the Milwaukee Radio Amateurs' Club to the first licensed United States amateur to work 56-Mc. two-way between continents, properly certified by documentary evidence. Complete details of this offer appeared on page 35, July 1937 QST.

The Wireless Institute of Australia reports that 56-Mc. transmissions are conducted by VK4's each Sunday at 0900 G.T. and at 0000 G.T. on the last Sunday of each month.

56-Mc. Reception Contest

In conjunction with the International 56-Mc. Transmitting Contest, and in order to encourage non-transmitting amateurs to collect and tabulate phenomena relative to the 56-Mc. amateur band, the R.S.G.B. has decided, provided sufficient entries are received, to offer a suitable trophy to the non-transmitter whose log covering the period January 1 to December 31, 1938, is considered by the Council of

that body to contain the most valuable information. Certificates of merit will be awarded to those submitting the most valuable information at the conclusion of the Contest, irrespective of the number of entries received. Logs must be received by R.S.G.B. not later than February 28, 1939. For the purpose of this Contest a non-transmitter shall be regarded as a person who did not hold a radiating permit on January 1, 1938.

DX Century Club

TWO more operators have attained membership in the DX Century Club since the November listing—G2ZQ and W1SZ. The total membership is only seven at this writing. Several operators have increased their standing, and we find some new faces in the 75-or-over ranks. That these listings represent real accomplishment is proven by the fact that so few amateurs seem able to qualify. What of those fellows who have been claiming such stupendous DX records through the years? Have they nothing with which to back up their claims? Amateurs the world over are invited to submit confirmations of contacts with 75-or-more different countries for QST listing, or 100-or-more for Century Club membership. See pages 59 and 60, September QST, and page 51, November QST for the rules and complete details.

MEMBERS, DX CENTURY CLUB

	Different Countries
H. A. Maxwell Whyte, G6WY.....	114
Frank Lucas, W8CRA.....	112
John Hunter, G2ZQ.....	106
Jefferson Borden IV, W1TW W1CMX.....	105
Douglas H. Borden, W1BUX.....	104
Henry Y. Sasaki, W6CXW.....	101
Clark C. Rodimon, W1SZ.....	101

The following have submitted proof of contacts with 75-or-more Different Countries:

* W1TS.....	94	W1DUK.....	80
W2GTZ.....	88	G2DZ.....	79
W2GW.....	88	W8KKG.....	78
W8OSL.....	88	G2DZ.....	78
W6GAL.....	86	VE2EE.....	78
W9KA.....	86	W3BES.....	77
W1ZI.....	83	W9ADN.....	76
W1DF.....	81	W2GVZ.....	76



THE "ULTRA ULTRA" IN PORTABLE POWER SUPPLIES

Benton White, W4PL, inspects the outfit that supplied power for W4CDC-4, Chattanooga Amateur Radio Club, in the June Field Day. The generator is mounted on a power lawn mower, direct-connected to a 1 h.p. gas engine. This "animal" pulls itself to the field, cuts the grass around the tent, and then contentedly furnishes juice as long as desired!

1.75-Mc. Code Practice Stations

Code practice transmissions for the benefit of beginning amateurs have been announced by the following stations: W1ASD, Hartford, Conn., 1882.5 kc., Tues., Wed., Fri., 7:30 P.M. EST. . . . W1ASZ, Pawtucket, R. I., 1925 kc., intermittent days, 6:30-7:00 P.M. EST. . . . W1GIX, East Windsor, Conn., 1823 kc., Mondays, 7:30-8:30 P.M., Thursdays, 9:00-10:00 P.M. EST. . . . W2DSH, Arlington, S. I., N. Y., 1833 kc., Thursdays (exc. holidays), 7:00-8:00 P.M. EST. . . . W2FYW, New York City, 1950 kc., Mondays, 7:00-7:45 A.M. EST, Fridays, 5:00-5:45 P.M. EST. . . . W2HRZ, Nutley, N. J., 1876 kc., Mon., Thurs., Sat., 8:30-10:00 P.M. EST. . . . W3GYR, Philadelphia, Pa., 1960 kc., Fridays, 6:00 P.M. EST. . . . W5CFQ, Paris, Ark., 1840 kc., Mon., Wed., Fri. . . . W5GAS, Fort Smith, Ark., 1910 kc., Tues., Thurs. . . . W7DVY, Seattle, Wash., 1965 kc., Fridays, 10:30-11:00 P.M. PST. . . . W8IFL, Plymouth, Mich., 1985 kc., Wed., Fri., 7:30-8:30 A.M. EST. . . . W8JYO, Cridersville, Ohio, 1874 kc., Tues., Fri., 6:30-7:30 P.M. EST. . . . W8BPB, Pontiac, Mich., 1763.5 kc., Tues., Thurs., 7:00-7:45 P.M. EST. . . . W8PBX, Cincinnati, Ohio, 1865 kc., Mon., Thurs., 6:45-7:15 P.M. EST. . . . W9BSP/W9UA, Olathe, Kansas, 1903 kc., Daily, 7:30-8:30 P.M. CST. . . . W9OPG, Cedar Rapids, Iowa, daily exc. Sun., 9:00-10:00 P.M. CST. . . . On the 56-Mc. band, W1HKE, Lawrence, Mass., sends code practice on 56.2 Mc. daily from 7:00 to 7:30 P.M. EST. . . . Station W8XH, Buffalo, N. Y., conducts a code class on 7.3 meters. . . . The W9BSP/W9UA schedule starts Dec. 15th, ends Feb. 1st.

More 1.75-Mc. amateur stations are needed to assist in the A.R.R.L. code practice program. Drop a line to A.R.R.L. Communications Dept., West Hartford, Conn., and we will send you some hints on how to conduct code lessons by radio.

O.B.S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October QST (page 50): W1ASI, W3CDQ, W4ASR, W4CXY, W6LFZ, W7FPN, W9DDF, W9ECY, W9VTG, VE3PL, VE4LQ.

Briefs

W2KJY inquires, "Did you hear about the fellow who worked for a condenser company and got discharged?"

W1AJ calls attention to his schedule with NY1AA, Balboa, Canal Zone. This schedule is on Monday and Thursday each week and has been in effect since early 1936. W1AJ solicits C.Z. traffic, which may be routed direct to him (7224-kc.) or via W1IOR through O.R.S. channels.

Field Day Reports

A report on participation of the Elmira Radio Amateur Assn. in the June Field Day was received too late for the report in November QST. W8CJJ-8 was the call used with W8CJJ, W8CHU, W8AYD, W8DZC and Lew Roy as operators. Score was 582. . . . 69 QSO's. . . . The score of W9KXJ-9 was erroneously listed in November QST. The correct score is 711. . . . The score of 333 credited to W2IXJ-8 should have been credited to W2IZJ-8 with W2HLI, W2ECL and W2IZJ as operators.

W7GEQ, who started in radio in 1907, suggests that we end our sign-offs with the year we started hamming, viz., '07, '12, '24, etc. This might prove interesting, especially in the case of 20-Year Club members.

How's DX?

THE 28-Mc. band is again in full swing at the time of this writing. If you want to add to your list of countries worked on 28 Mc., now is the time to do it. You'll stand a good chance of working some new ones too.

W8MAH, Williamsport, Penna., sends in some very interesting general information on conditions on 28 Mc.:

"There are a few generalities which can be mentioned at this time about 28 Mc. that may be helpful to many of the gang. These are based upon general normal conditions.

"European stations come through in the mornings and stay in, with a weak period around noon (E.S.T.), until 3 P.M. The South African stations come through rather poorly from 10 A.M. until noon, when they start to become very much stronger, reaching a peak between 1 and 3 P.M. with fade-out shortly thereafter. South Americans seem to be best from noon until 8 P.M., with their best signals from 5 to 8 P.M. Australia comes through as early as 3 P.M. and stays until an average of 8 P.M. This is also true of ZL's and K6's. The signals from Japan, based mostly upon JN's harmonic, start coming in around 4 P.M. and build up for a short while, but have a very weak to fade-out spell between 5:30 and 6:00 P.M., after which they are much stronger, but gradually fade out to stay about 7:30 or 8:00 P.M. Signals from India and thereabouts seem to be best between 10 and 11 A.M.

"The following frequency list was carefully made: ZS1AH 28050 28092, ZT6J 28330 28550, ZT6Y 28100 28330, ZT6AU 28180, ZT2Q 28070, ZT6AK 28100, ZU6P 28325, ZS1AJ 28085 28200, ZS6T 28120, ZE1JJ 28230, ZE1JR, 28170, LU3DH 28180, LU7AZ 28200, LU5AN 28180 28300, LU6AX 28180, OA4J 28300, PY1BR 28320, PY3BY 28290, K5AY 28050, K5AG 28170, TI2RC 28115, HR4AF 28350, CN8AV 28530, FQ8A 28060, I1KN 28260, CT1KH 28210, YL2CD 28170, OH2NM 28300, OH2NB 28075, LA4P 28240, YR5CF 28000, YM4AA 28000, D3BMP 28000, D4FND 28075, OK2MV 28125, OK3VA 28135, OK1FF 28040, F8RR 28200, F8BS 28130, F8GQ 28075, F8WK 28135, GM5KF 28200, F8HS 28470, K6NYH 28280, ZI4DQ 28200, ZL1MR 28100, ZL1DV 28125, VK5KO 28000, J3FJ 28170, VU2CQ 28320."

W3EXB worked ZB1C 28600 which, he believes, is the first ZB-W contact on 28 Mc. He also reports TF5C 28480. W2GW worked VS1AA 28325 for an hour recently around 10 A.M. E.S.T. W1EWD reports U9ML 28150, and SV1RX 28175 and others. VU2AU is coming through quite regularly on the East Coast at 7:30 to 8:30 A.M. on about 28100. He has moved recently and is now located at Quetta, Baluchistan. Europeans come through as early as 7 A.M.

W8MAH QSP's the information that VKSKO needs only Vt., R. I. and Md. for 28-Mc. WAS. He is on daily from 2030 to 0100 G.T.

On 14 Mc. W2GTZ reports recent QSO's as follows: PK1BO 14160, PK1RI 14300, PK1MF 14310, PK1VX 14340, XU8RL 14300, KA1AN 14398, VU2FV 14070, VU2FH 14170, FQ8AB 14260, FP8PX 14350, K7GIE 14014, K7DAM 14010. He has also heard ZA4X 14420, US1D 14430, XZ1S 14260, XU8HM 14015, J2OY 14140, VQ8AS 14130 and F18AC 14240. His claimed countries now totals 104.

W9AXX works them with an 807 final. Some of his more recent contacts are: MX2B, PK3LC, V8TMB, VS1AE, SM7QD, J9CA and XU8ZT. RXJB, who gives his QTH as Gold Coast, Africa, was worked recently by W2CYS. His frequency is 14370. Whether ship or shore station we do not know. W2CYS, by the way, does some nice work with an attic antenna. Look them over—PK1MF 14280, KA1AN 14405, XU8RL 14280, K6JG (Guam) 14270, FR8VK 14440, VU7FY 14386, OX2QY 14386, V87MB 14275 (5 P.M. E.S.T.), VR4CD 14340, VS1AF 14040 and VS4CS 14290.

W9ALV reports VS6AO, VQ8AS, YV5AP, F18AC, VU2FH, VU2FD, VU2FS, VU2FX, UK8IA, US1D, YU7XX, CN8AV and KA1QL. CM2AO has worked VR4AD on 14085. UPOL is still active according to W8PMB

who worked him at 11 P.M. E.S.T. His frequency is 13995. W3EXB reports a new one, AA5CN 14450, who gives his QTH as Tangier Zone, North Africa. VO3P worked AC4AA for his first Asian. Anyone know anything about him? W9ALV and W7DXZ have worked F18AC 14260. This makes 79 countries for W7DXZ.

For the past several weeks, conditions on the East Coast have been very good for Asia, chiefly between 6:30 and 9 A.M. In addition to many of those mentioned elsewhere, we have heard or worked VS7RP 14255, VS7JW 14350, VU2DR 14150, J2DI 14225, J6DN 14075. If any of you DX men in the East happen to be prowling around at 3 to 4 A.M., it might pay to take a listen over the 14-Mc. band. Occasionally the J's come through at this time with stronger signals than at any other time. They may also be heard between midnight and 1 A.M. and from 4 to 6 P.M. as well as the usual 8 to 9 A.M. period. The competition is not so tough in the early hours and they may be raised more easily. Other Asians come through frequently in the early evening.

A new U9 is U9AX 14380 located in Novosibirsk. He worked W1 for his first QSO on the air. U6AN and U6ST are among the newer stations heard from the trans-Caucasus region.

The atmosphere of suspicion surrounding XZ1S has been cleared up by W8CRA, who received a handmade QSL. XZ1S is in the Asiatic fleet operating under cover. He made most of his contacts from Singao, China.

Checking cards for the DX Century Club has revealed the disappointing fact that none of the FF cards submitted thus far confirms a contact with French West Africa. Checking the locations given on the cards with the map shows that all of them are well within the boundaries of Algeria. Why they use the FF prefix, we do not understand. As far as we know there is no ham activity actually in French West Africa.

ZATA worked recently is apparently a foney. G6WY says ZA3X is also reported, but as far as the R8GB Headquarters is aware there is no activity in Albania, legitimate or otherwise.

VK5RX furnishes the QTH of FN1C. He is D. W. Patterson, Gondalajara, Chandernagore, Bengal, French India. VS4JS is in Jesselton, North Borneo. W2GFF says that VQ8AS (Chagos Is. in case you haven't heard) uses 10 watts input. VO3X is doing some nice DX work with his 807 final. He needs Mont., Wyo., Ida., Ariz., Nev., Miss. and La. for WAS. We don't doubt that there are several fellows in each of these states who would be glad of a VO contact.

Those of us who did not work K6LHA or K6TE while they were at Wake Is. will have to wait awhile. Both are now back in the States.

Rumors are circulating about in DX circles that YI2BA sent a batch of QSL's which were returned by A.R.R.L. Headquarters office because of insufficient postage. This rumor is entirely untrue. If the cards were actually sent and were returned, they must have been stopped before they arrived at the West Hartford post office. To date, we have heard from no one who has received a card from YI2BA.

The Postmaster-General's office for Kenya, Uganda and Tanganyika advises us that the call of VQ3MSN is being bootlegged. He is receiving several cards from W stations although VQ3MSN has been out of operation for a considerable time.

When it comes to fone DX, it takes an SWL to haul them in. We are much indebted to W. Mayes of Maywood, Ill., for the following list of 14-Mc. fone frequencies: VS2AO 14260, VS2AK 14260, VS1AI 14040, VS1AB 14250, J2MI 14100, KA1ME 14150, KA1MM 14090, PK3WI 14030, PK1MX 14320, PK1GL 14260, PK3GD 14020, PK4VR 14375, PK3ST 14310, PK1RI 14375, PK6CI 14080, VK6WS 14145, VK6MU 14140, SU8MA 14090, Su1SG 14375, TG1AX 14105, LA1G 14130, CN8AM 14100, CN8AJ 14090, W1HKK reports the following 14-Mc. fones: FA3HC

14300, ZU6P 14120, EA9AH 14000, EASAE 14010, HA4A 14140, HA8N 14120, PA0MQ 14100.

W6ITH says to listen for South African and Asian fones around 8 A.M. P.S.T. and Europe around 11 P.M. He has recently worked Z81AV 14272, VS2AK 14256, G2PU 14120, G6LK 14100, F300 14140, ZS5M 14314 and ON4VK 14050 Reg now has 58 countries on fone. He furnishes the QTH for FISAC whom he has worked on fone as R. R. Lebon, P.O. Box 13, Hanoi, French Indo-China.

W6AM made WAC on fone in one day, an unusual accomplishment for W6.

A high power fone in Austria will be on the air soon. The call is OE1RV. The transmitter will run an input of 600 watts compared to the average input of 50 watts used by other OE stations.

The ZL's are now permitted to operate fone on the frequencies of 14150 to 14250 kc. between the hours of midnight and 7 A.M. local time.

From W6TT we learn that on one occasion over fifty women crowded into KA1ME's shack to talk to their husbands in Shanghai via XU8MC.

VP9G in Bermuda is now on fone on 14280 doubling the former VP9 fone forces. A new one to look for in British Guiana is VP3PH 14050.

We hear XZ2DY about 14375 frequently around 7:30 A.M. E.S.T. He uses fone mostly, but occasionally gives the c.w. boys a break.

W1JPE is travelling through the western section of the country this month. He should be able to give some interesting slants on DX from the West Coast next month.

73 WITS

Briefs

W8FU lists the following hams all of whom are employed in the radio transmitter building at the General Electric works, Schenectady, N. Y.: W1CPN W2DC BXC CNF DFX EHF CBO CSN KFN KLM EBG HTR CJP JKF DSH CEM JQP IKA CVV FRY JHD W4FM TR W6ASQ W7GHN W8PI JHW FU EBR W9AHH BZD TYO FPX ex-K6MEG W2CCG W3FRR W9EE. These fellows work on the transmitters made for the Army, Navy, Coast Guard, Fireboats, Police and many other services.

The ham program from WILL, University of Illinois, has changed time to 1:30 P.M., Saturdays. This program is heard in all neighboring states and news is solicited. Address and reports and comments to Bill Livesay, W9MLH, care of the U. of Ill., Champaign.

A snow trip to the Feather River Canyon is being planned by the Oakland Radio Club. A special train will leave Oakland on a Saturday night and return Sunday night, spending six or seven hours in the snow. Refreshments will be served in the special car attached to the train for that purpose. A baggage car will also be in the train for the purpose of setting up transmitters (56-Mc. rigs to be used mobile and other rigs to be used at the destination). The exact date and price of the trip has not yet been decided. Anyone interested may write Oakland Radio Club, Inc., 1018 Oak Street, Oakland, Calif., for further information.

During October W8DMF took his portable rig with him on a hunting trip into the mountains of Clay County, W. Va. By evening he found the rivers had covered the highways and isolated him. Amateur radio to the rescue, he fired up the portable outfit and via the W. Va. Net had W8LII phone his family that he was OK!

W4AXP suggests that when our brother hams are ill, at home or in the hospital, we pass the word around among the gang with the request that everyone write a line of cheer to the fellow who is laid up. AXP says, "One rose by the sick bed is worth ten wreaths on the casket." During a recent spell in the hospital he found much pleasure in the letters and cards received from brother hams.

From W2BYX via W2GMN: The National Broadcasting Company operates two ultra-high-frequency transmitters daily from 8:00 A.M. to 11:00 P.M. W2XDG operates on 38.65 Mc., transmitting the programs of the Red Network; W2XHG on 41 Mc. carries the Blue Network programs. Each station is of 100-watt carrier power. The N.B.C. is glad to have reports of reception.

U. S. S. Chicago Works Amateurs

An exercise between N.C.R. members in the 12th Naval District and the U.S.S. *Chicago* was part of the radio program for Navy Day, October 27, 1937. The *Chicago*, NAGM, used 3475 kc. and listened for N.C.R. members between 3500 and 3900 kcs. Two receivers were used on the cruiser to facilitate finding the N.C.R. stations. All transmissions were in proper Naval procedure and the messages consisted either of greetings to the Navy generally, or to some individual with whom the N.C.R. member was acquainted. A QSL card was sent to every station worked. During the NPG Navy Day broadcast the *Chicago* circuit was secured so that all hands could copy the message from the Secretary of the Navy; 105 stations were worked by NAGM during the period 4:00 to 10:00 P.M. This was the third annual contact between the N.C.R. and a Naval vessel anchored in San Francisco Bay. In 1935 there were 77 contacts; in 1936, 92 contacts. The drill was under the supervision of Lt. Sydney J. Fass, U.S.N.R., W6NZ, who was the Navy Day Chairman for Radio in the 12th Naval District. The ship's radio room was literally turned over to the N.C.R. and its equipment was operated by N.C.R. men.

The Oakland Radio Club is holding its annual 56-Mc. contest, starting the first Friday in December. The rules are practically the same as last year. Two loving cups are offered, one for the highest scoring mobile transmitter, one for the leading fixed station. Points will be awarded on mileage. For further information contact W6NOE, the 56-Mc. chairman, or W6ZM, secretary of the Oakland Radio Club.

The following is quoted from the U. S. Coast Guard Communication Bulletin, October, 1937: "On 14 August, 1937, the *Spencer's* Plane V-144 was dispatched on an assistance case which involved the transporting of an injured man from Port Hobron, Kodiak Island, Alaska, to Seward, Alaska, for hospitalization. Through the cooperation of the Army Signal Corps Station (WXE) at Anchorage, Alaska, the *Spencer* contacted amateur station K7BVA at Port Hobron, the destination of the flight. Direct contact was established with K7BVA, the *Spencer* using 4050 kc. and K7BVA using 7200 kc. Through this contact, progress of the flight and developments at the scene of the accident were rapidly dispatched between the *Spencer*, the plane and Port Hobron. K7BVA maintained a continuous watch from 2000, 14 August, to 0800, 15 August. The operator at K7BVA, Mr. H. L. Riebe, performed commendable service.

20-Year Club

NEW 20-Year Club members: W1DMP W2BYW W2DI W2DYT W2GVU W2HCO W2IW W3ACX W3GJ W5NT W6AM W6KTQ W6MSN W6NPD W8APD W8CNX W8ND W8ZY W9AA W9CSZ W9CX. Membership in this group of old timers is open to any amateur who held a license (amateur operator or station) 20-or-more years ago and holds a ham call to-day.

Merrill E. Gregory, W3JL: "1910 used call MG—Ford spark coil somewhere between 400 and 1500 meters. Crystal detector-receiver coil somewhere's around 14 inches long. Later a 1/4-kw. Acme with Murdock rotary gap. Closed down during World War. After war licensed as 3JL and came on with a 1-kw. Thor. and rotary gap. Used Audiotrons for receiving with honeycomb coils on 200 meters, finally changing to two 5 watt tubes self-rectified. Hold

oldest ticket in Morris County and the 2nd one issued. Been off the air less than a month during said period. Using the call MG, or as I used to make it . . . (9)—Boy, those were the days!" *Arthur C. Jacoby, W3DRO*: "After learning the code in 1914, I started out with a one-inch spark coil home made glass condensers, and tuning inductance as the transmitter. For receiving I made use of a Clapp-Eastman tuner and variable condenser, crystal detectors, such as silicon and galena, and a pair of Brandes 'phones. My first operator's license issued to me was an Amateur, Second Class, received through the mail. At the same time I was issued the call letters 30V. The following year, 1915, I took a personal examination at the Navy Yard, Philadelphia, Pa., and received an Amateur First Class Operators License. The same year I also constructed a 1/2-kw. spark transmitter, with a non-synchronous rotary spark gap. This equipment was used with moderate success until this country entered the World War when I was notified to dismantle the station. In June 1916, I entered the employment of the Marconi Wireless Telegraph Co. of America and subsequently the R.C.A. I remained with them for a period of four and one-half years, and then obtained a local position. All amateur activities were dispensed with until I was induced to sign up with the Naval Communication Reserve in 1932. In May 1933 I again took the Amateur examination and, having passed the same, was issued my present call letters W3DRO." *G. S. Corpe, W6LM*: "Had my first station in Santa Barbara, Calif., in 1909; call letters 'XRX.' (All hams in Santa Barbara belonged to a club which we called by the slightly ambitious title 'Southern California Wireless Association,' and all calls ended in 'RK,' the only differences being in the first letter.) The heap was a 1" spark coil; helix, and huge 6-wire antenna. Receiver loose-coupler and 4 or 5 crystal detectors, Brandes Navy Type Phones. After two years of hamming I went to San Francisco and went to sea for the old United Wireless Co. Took the examination at Mare Island Navy Yard and secured my first license—'Certificate of Skill in Radio Communication' and still have it—hi. I should tell you about that examination at Mare Island. It consisted of four questions and a code test, given over the air from NPH—the Examiner would 'phone the station and have them transmit for the tests! Come here to El Monte and with my brother bought the local Ford Agency in 1914. Had a ham set, of course; call letters 6GE—by that time the Radio Act of 1912 was passed and hams had to be licensed. When the War started, enlisted in the Signal Corps. Was discharged early in 1919 and got back to the Ford business. Did a little plain and fancy bootlegging with a receiver before they lifted the ban; then secured license 6LM and still have it. When broadcasting started, owned and operated KUY for a couple years, also having experimental license 6XAX. Sold KUY to the first KNX in Los Angeles—KNX has grown from that first 100 watt to a 50,000 watt—hi. Joined the A.R.R.L. in early 1916 and been with it ever since. Wish all 'later model' hams could realize as I do the debt we owe A.R.R.L. I am absolutely sure there wouldn't be any ham radio except for our A.R.R.L. Have a complete file of *QST* magazines—from the first right on. My principal hobby for 25 years has been collecting old radio items; have about everything in the collection you can mention, now. The prize item is a 'DeForest Wireless Responder' of 1904 vintage—electrolytic detector 'noverything.' *Joseph Fairhall, Jr., W9VY*: "The first real notice that I took of wireless was at the time of the great Titanic disaster. My early connection with radio was using a small crystal detector and an old slide Navy type tuning coil. By very careful tuning of the coil and with the aid of the crystal detector we were able to tune in the time signals of NAA at 11 A.M. C.S.T. During 1917 I applied for my license and was given the two-letter call 9VY. Have held it ever since. At last a detector tube came out for the amateur; cost \$4.50. A long slim tube with three wires on one end and two on the other and we had to make our own base. When one side of the filament burned out we simply hooked onto the other wire and went ahead until it burned out. My first transmitter was a small Ford coil. Later on 1/4-inch kw., then 1/2-kw., and finally what we called in those days a rock crusher which was full one kw. using a special Westinghouse Synchronous Motor, 9-tooth spark gap, with points 1 1/4 inches

wide, inductance made of copper ribbon 3 inches wide, and full 1-mfd. condenser 3 ft. long, 1 ft. wide, 1 ft. square, using plate glass plates with sheet copper between the whole thing submerged in transformer oil. The coil was an immense affair generating a terrific voltage which would easily jump a seven inch gap. In those days we used to have a lot of fun pounding out on 200 meters, more or less. One hundred miles was wonderful DX. I had a lot of fun broadcasting music with a little transmitter made up of four 201A Tubes and using for plate voltage the juice from Trolley wire. I have had a lot of fun following the wireless game all the way through. I believe the real kick was back in the old spark. I have saved nearly all of my early apparatus, and some day am going to make a display of it for our amateur club to look over." *Edward Lipson, W5ERJ*: "Became interested in Radio in 1908 using the usual coherers and spark coils of that date. Call letters were 'ELM,' my initials and 'M' for Mass. In looking over some old call books recently, I noticed one called the 'Second Annual Official Wireless Blue Book of the Wireless Association of America' to June 1, 1910, with my call 'ELM' listed with a 4-inch Jump spark coil as a transmitter. Another call book called the 'Amateur Wireless Stations' within 20 miles of Boston compiled by the Harvard Wireless Club to March 11, 1912, with my call ELM listed using a 1/2-kw. transmitter. When the Radio Law came into effect I received a 1st Grade Commercial Operators License and held it to 1921. My call received then was 1SC. The station was closed down during the War. Served in the Signal Corps from 1917 to 1919 during the War as Chief Assistant Instructor in Radio Telegraphy and Telephony, Land and Air Forces, Army Signal Schools, Langres France A.E.C. In 1934 went back to the amateur field with call WIHWL. Moved to Texas and received call W5ERJ which I am now holding." *Stewart S. Perry, W1BB*: "Interested in tuning coils, detectors, Tesla coils and general electrical experimenting 1914-1917. April 7, 1917, received amateur first-grade license. Had Ford spark coil rig all ready for use but same day, as operator's license was issued, orders came from Washington to close all amateur stations on account of the War. Therefore, no station license was issued. Continued electrical and chemical laboratory work during the War. Was 28th in line at Boston Customs House the morning after the ban was lifted and received call 1BB October 2, 1918. This has been held without interruption to date."

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below: (The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the giving of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon of the dates specified.

Section	Closing Date	Present SCM	Present Term of Office Ends
San Diego	Dec. 1, 1937	Harry Ambler	Dec. 16, 1937
Maritime*	Dec. 15, 1937	Arthur M. Crowell	June 14, 1937
Nevada	Dec. 15, 1937	Edward W. Helm	June 14, 1937
Ca.-Cuba-I. of P.-P. R.-V. I.	Dec. 15, 1937	Bannan L. Stewart	Dec. 14, 1936
Virginia	Jan. 3, 1938	Charles M. Waff, Jr.	Jan. 17, 1938
Alabama	Jan. 3, 1938	James F. Thompson	Jan. 17, 1938
Alberta	Feb. 1, 1938	Alfred D. Kettenbach	Feb. 18, 1938
Washington	Feb. 1, 1938	Robert H. Votaw	Feb. 17, 1938
Montana	Mar. 1, 1938	Russell U. Richmond	Mar. 13, 1938

*In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager, Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager for the next two year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed

from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

Communications Manager, A.R.R.L.
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the Section of the Division hereby nominate as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of A.R.R.L. members are required.)
The candidates and five or more signers must be League members in good standing or the petition will be thrown out as invalid. Each candidate must have been a licensed amateur operator for at least two years, and similarly, a member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated. The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no members shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

—F. E. Handy, Communications Manager

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Eastern Florida L. A. Connolly, W4DVO Oct. 15, 1937
In the Missouri Section of the Midwest Division Miss Letha Allendorf, W9OUD, Mr. Henry J. Eschrich, W9KEF and Mr. Fred M. Kamp, W9KEI, were nominated. Miss Allendorf received 57 votes, Mr. Eschrich received 56 votes and Mr. Kamp received 23 votes. Miss Allendorf's term of office began October 19, 1937.

Station Activities CANADA MARITIME DIVISION

MARITIME—SCM, A. M. Crowell, VE1DQ—FQ has been appointed P.A.M. and is lining up a 'phone net. JA and GR, together with WHIM, handled a death message to resident of Glace Bay visiting the States. Thanks also to WIAUJ, W1FBJ and W1AXE who aided in QSP. GK has an ACR-136. JZ has finished his nine-tube super. At a recent meeting of the H.A.R.C. the following officers were elected: pres., AW; vice-pres., EK; secy.-treas., FB; asst. secy.-treas., FO. BV snagged his first VK 'phone'—using only about 15 watts and an indoor ant. too!! EA has a new RME 69. Moncton notes via EV: LP's new rig will use 58, '45, pair '45's. CX has new exciter completed—89 and RK25. IL has annexed a new Sky-Buddy. IJ is rebuilding to 50, 50, pair '46's. DC has new band-switching rig nearly completed. EV changed QTH to help out B.C.L. QRM. New officers for the M.A.R.C.: IJ, pres.; CX, vice-pres.; EV, secy.-treas. St. John news via EE/KZ, press rep. for L.C.A.R.C.: At the opening meeting of the season the L.C.A.R.C. members fully discussed the B.C.L. interference problem and the various steps which may be taken to eliminate this trouble. GP has moved in from his summer home after a successful summer on 14 Mc. IF operates on 28 and 3.9-Mc. 'phone. FL gets FB quality reports from everywhere. FC is on again. GQ sounds nice. EI is on 14-Mc. 'phone. JN has a new super-het. KZ is heard occasionally. EE put up his doublet again. BF is making a small stand-by transmitter. KQ is back on 7 and 3.5 Mc., '46 and T20. JP is rebuilding with P.P. T20's. VO4A schedules CN and AB on 7086 kc. Active VO boys are II, 6JQ, 6L, 3Z and 2Z. Many of the VE1 gang were glad the OIC (Dick) of VE5TV arrived back safely in the old home town.

ONTARIO DIVISION

ONTARIO—SCM, Fred H. B. Saxon, VE3SG—R.M.'s: 3ABW, 3DU, 3GT, 3MB, 3QK, 3TM, 3WK. DH has a new second op; congrats, Jack. QB has at last got hydro power and is using 41 crystal osc., 6L6 amplifier with 40 watts input. PL is now in Toronto and is on the U. of T. staff. MB had visits from GA, YC, ACF, AIK and UO. QK joined the Michigan Net on November 1st. NC has had a flock of visitors this fall. ABW has new antenna up. VC sold his FB-7 and now has a t.r.f. SG is lone VE in traffic net with six W's; each op is O.R.S., R.M. or S.C.M. ABC, up beyond Kenora, has a 2A5 crystal osc. and 6L6 doing nicely. ZE has his rig working nicely on 3.5 Mc. VA has taken over T.L. "I" in Ontario. WK is picking up his old schedules. Watch next month's report for the announcement of a SECTION QSO PARTY. The North Toronto Club had a splendid meeting at the home of EO. LG is new in Windsor. CP is working 3.5, 7 and 14 Mcs. AU worked 8 hours in the VK-ZL contest, scoring 3530. The Ottawa Club is away to a good start for the season. RK, SR, XL, and PD, all from Ottawa, are at Queens this year. SS is studying for 2nd Class Commercial ticket. HY is contemplating a swing to 'phone. HV has a new Collins 45A. ADZ is on with an '03A. OI needs Nevada for W.A.S. DH is keeping traffic schedules with temporary rig while rebuilding. AND has new antenna. RR is back with an FB 'phone. After a season of hard work DW and the YF are getting back to their old haunts—the shack. BY has 6L6, RK23 and T55 with 125 watts and is contemplating O.R.S. ZQ, late of Ottawa, asks me to let the gang know that he is now on the Radio Beacon Station at Regina, Sask., and will be glad to hear from the eastern fellows. Let's have more news next month, gang, 73.

Traffic: VE3QK 144 SG 72 AU 65 GT 41 DH 32 AJB 31 VA 29 NM 23 PE 12 OI-QB 10 MB 9 SS 8 AA 7 ABC 5 AND 4 WK 3 ZE 2 VE9AL 16. (August-September: VE3AID 6 QB 2 MB 1 VE9AL 12.)

QUEBEC DIVISION

QUEBEC—SCM, Stan Comach, VE2EE—Thanks to those who so kindly wrote the S.C.M. FK deserves credit for being the highest Canadian 'phone scorer in the recent DX tests. FT is rebuilding. KN has a schedule with Ottawa three nights a week. We regret to hear that HH has been confined to bed for some time. We hope for an early recovery, John. NX would like it mentioned that she is a YL; Miss Valey operates on 7170 kc. DP is planning a new transmitter with a pair of T-20's in final. HG has received his W.A.C. 'phone certificate; the Prof. handled a message from VP3BG for Lachine and had a reply back to BG in 20 minutes. JK is now located at Northwest River, Labrador, and is using the call VO6L. JJ is the new treasurer of the M.A.R.C. W2KKT was a visitor at DR. LJ and LU, along with some of the gang, took part in the Army maneuvers. BU is back on the air keeping his old schedules, Hartford and Toronto, daily. KM has half of his new rig perking. FF is an old sea-going op and met your S.C.M. when he was on the S.S. Canadian Volunteer, running to the West Indies. AB, LQ, AP and KO were on a fishing and hunting trip end of Sept. and were the guests of NI and his YF. EM paid a short visit to AB in Quebec. Your S.C.M. had the pleasure of a month's stay in Quebec, meeting the gang; a special debt of gratitude is owed to FA, DL, AB, EY and HL for their many kindnesses. HD is operating on 56 Mc. with EY. NI, HL and CH have been handling traffic from the Expedition Schooner Marie Therese, whose operator was KI. EK is now Chief Engineer at CHLN, Three Rivers. DU, II, IO, HP and HL traveled down to join the boys at the Bridgeport Convention, and all won prizes; the same gang won first prize in the musical amateur show. HY was down at Three Rivers for the opening of CHLN. DF has erected a Diamond antenna and is getting plenty of DX. EU and AG are active on 3.9-Mc. 'phone. IN is back in town and has resumed studies at McGill. EW sold his old transmitter to a prospective ham. AY spent three months up in the Ontario mining district. LQ visited the big city recently. CR has moved to Patricia Ave., N.D.G. BG has been having quite a few contacts with Y12BA. Elections at the Club "Les Amateurs Canadiens-Francaise de la T.S.F."

(Continued on page 108)



CORRESPONDENCE

The Publishers of QST assume no responsibility for statements made herein by correspondents

The Facts on RST

Box 626, Riverhead, L. I., N. Y.

Editor, QST:

In reference to the editorial in the October, 1937, issue of QST, dealing with signal strength reporting, I should like to explain a few points which may not be familiar to some of us. Considerable time has elapsed since the original article on RST appeared (October, 1934, QST), and some may have forgotten the underlying reasons for advancing a new system. I should like particularly to bring out certain phases of RST which have not been stressed before.

The new system was devised with the idea of correcting certain evils which had grown upon amateur reporting practice. In the first place, I felt that our reporting procedure should be systematized. Where previously there had been no system whatever, just the indiscriminate use of the three separate scales, I attempted to substitute an orderly system which would both standardize and facilitate the exchanging of reports. In the second place, I wanted to rationalize the scales themselves. The existing codes of so-called "readability," audibility, and tone, which were contradictory and inconsistent among themselves, were replaced by three scales, (R)eadability, signal (S)trength, and (T)one, which could be used singly or together without any conflict or change in meanings.

Referring now to the signal strength scale, it embraces a certain range of strength. This range is the same whether we divide it up into 5, 9, or any number of gradations. Since the new signal strength (S) scale and the old audibility (R) scale each have nine steps, if we should strip them of their definitions, they should be identical, theoretically. In each scale, any given step should be in the same ratio to the corresponding adjacent step. That is to say, if S7 is twice as strong as S6 (assuming received signal intensities to be measured in voltage), then R7 should be twice as strong as R6. Practically, however, this is not true, because, unfortunately, this simplicity in the audibility (R) scale was destroyed by an unwise choice of definitions. Take a look at the old R scale. Besides an illogical arrangement of the wording describing successive steps, such as going from "moderately strong" to "good," and then to "good strong," irrelevant terms on readability, interference, and audio strength were injected into them. It was a case of trying to

make one code cover too many things, and not doing a good job on any one of them. The same thing also happened in the old tone code. It was *these qualifying terms* that ruined the chances of the R code ever being used to correctly rate signal strengths. It is human nature to follow the definitions, and if a signal is not capable of overriding bad QRM it is pretty hard for the conscientious operator to call it R7, even though its actual strength in the absence of the QRM would make it so. This is true also for the other gradations containing readability or audio-strength terms. The practical result is that a given step does not always describe a signal a given strength above the preceding step. From the foregoing it is evident that in the interest of accuracy the old audibility code should be forgotten as soon as possible, both in 'phone and c.w. work.

It was with the view of correcting these difficulties that the S scale was devised. It was desired that this scale should describe signal strength, and signal strength only. In it will be found no definitions whose meanings can be influenced by extraneous factors, such as readability, interference, etc. S7 should refer to a signal a definite amount stronger than S6 under any possible condition. Actually, of course, the wordings of the definitions have no quantitative meaning, and it is this very quality which gives the scale its great advantage. It should be remembered that in the strength scale *the numbers are the steps*; the definitions are given merely as an aid in distinguishing between steps. It will be noted that a logical progression in definitions was adhered to; for instance, a "fairly good" signal is lower than a "good" signal, but higher than a "fair" one. Similarly, "moderately strong" comes below, but next to, "strong." This should explain any discrepancies between the S and old R scales.

Examination will reveal that the same plan of assigning definitions was followed in the readability and tone scales, always as smooth as possible a progression of increasing values. In the case of the tone scale this was naturally not quite so simple, but, as pointed out in the editorial, the limits were fixed, and all types of notes had to come between them. So we have in the middle the musically modulated note, which is the point where a.c. and d.c. meet. Toward either end of the scale the a.c. or d.c. component becomes increasingly predominant. It will be remembered

that the "x" or stability term was carefully kept separate from the tone characteristics.

If, as was stated in the editorial, amateurs in making reports are influenced by such factors as conditions, noise, distance, etc., it is indeed unfortunate. It was hoped that the new system would tend to correct such practice. An S6 report to England should be exactly the same as the S6 report to a "W" or a "J," under any conditions. Otherwise, signal rating becomes meaningless. I always try to rate a DX signal strictly on its merits, with no "weighting." I should like to feel confident that the fellow at the other end is doing likewise. I believe we should all earnestly endeavor to be more conscientious in this respect.

The signal strength scale as we know it embraces a certain range of signal intensities. This does not mean that S1 is the weakest signal we can perceive on a two-tube set with 'phones and S9 is the loudest signal we can stand out of a loudspeaker system. The original scales were devised when receivers consisted of a detector and one or two stages of audio, plus headphones. *Estimates of signal intensities to be done with any degree of accuracy by ear should be made only at headphone levels.* The loudspeaker is "out," because above headphone levels the ear is no longer accurate as a measuring device.

It has been found, through the researches of various investigators, that the average difference in signal intensity between successive steps is roughly in the order of 6 db. This corresponds to a change in strength of two to one (four to one in power), and this is about the minimum difference in level that can be distinguished over a radio circuit. It is true that for a perfectly steady, pure tone an instantaneous change of as little as 1 db can be detected. However, in a space circuit, where fading ratios are important (and it is surprising how much a seemingly steady signal actually fluctuates in strength), this is not possible. The situation is further complicated in the case of a keyed or modulated signal.

Since each step represents an increase of about 6 db, the total range of signal intensities from 1 to 9 is seen to embrace approximately 48 db. It is rather fortunate that this is true, since 6-db steps are very convenient to use in making calibrations. In the future, time permitting, I hope to be able to prepare a short article dealing with the measurements on which these conclusions are based. In the meantime it is hoped that this discussion may serve to satisfactorily clear up any misunderstandings which some may have concerning the aims and purposes of RST.

—Arthur M. Braaten, W2BSR

More on Planned Use

612 Atlantic Ave., Morris, Minn.

Editor, QST:

I have been planning on writing the League for some time. The new "Sub-division Plan" by D. A. Griffin in October QST is the spark that has set me off.

... I have yet to see our radio misanthropes offer any plan which promises to do anything really constructive. It is this which I am venturing to undertake.

I have an ACR 175, and when I tune over the broadcast band I marvel at the sharp tuning and lack of interference. The reason for this is that "it was planned that way." All stations on the b.c. band must use a frequency which is a multiple of 10 kc. This is because a receiver when heterodyning stations 10 kc. apart makes only one audible, since 10 kc. is too high a frequency to hear. Thus the b.c. band is free from whistles and cat-calls other than those due to the radiation of the harmonics in the beat oscillators of other receivers.

... There are four types of [broadcast] licenses: local, regional, high-power regional, and clear channel. In amateur radio this classification would not be practical; we would all be together. In amateur radio if a kilowatt 'phone comes on he blots out the lesser ones anyway, but if you were 10 kc. away you would not be blotted out by superior power, at least not on a good receiver.

... Now if two 'phones are 15 kc. or so apart and an-

other station attempts to come in between, all three are blotted out, yet there is 5 kc. going to waste.

Suppose we put it this way. If the only frequencies to be allowed were ones such as 1800 kc., 1810 kc., 1820 kc., 1830 kc., etc. (plus or minus 500 or so cycles per sec.), then it would be possible to hear without interference or whistle 20 'phone stations at one time, believe it or not. Now since the c.w. men do not use the 160-meter c.w. band, why not give that back to the 'phones, making a possibility of 29 perfect 'phone signals on the entire new 160-meter 'phone band. In contrast, what does one usually hear? One night recently I heard a station in Bensonville, Ill., say that though he had a receiver that cost over \$100.00, he could make out only two stations in the entire 'phone band, which was no worse than I could do. Many nights I can't make out more than four, and seldom more than eight. However, the band is swamped with whistles and gibberish, which shows that there are plenty of those who would like to use the band if it could be made usable.

There is another advantage, too. Since amateurs generally answer those on or near their frequency, there would be many times when QSO's would take place on one channel, instead of occupying two, as is usual. This would be more and more the case as time wore on, and amateurs acquired more than one crystal.

Now about the interference caused to the tune of 67 per cent. by 160-meter 'phone. C.w. causes a more annoying interference than 'phone in the estimation of everyone I have talked to.

Moreover, there is a way of reducing b.c.l. interference and harmonics as well. As the electric field is shielded in coaxial cable, radiation from the feeders is greatly reduced or practically eliminated. I know such cable is quite expensive. But W9JDO reports that b.c.l. QRM was greatly reduced, presumably for the same reason, i.e. feeder radiation is greatly reduced, by the installation of EO-1 cable. He also reports that harmonic trouble with Grand Island was also eliminated.

It seems more practical to require coaxial feeders by law, for 160, rather than give up the 160-meter band entirely. The amateur would find his sock improved in value by more than the cost of the coaxial cable. . . .

—Dwight Stebbins, W9WLK

EDITOR'S NOTE.—Some dozens of comments on W2AOE's sub-division plan published in October QST have been received, some pro, mostly con. No attempt is being made to publish these letters because for the most part they are merely comment, offering opinions but no new thoughts. They are being held for the attention of the League's planning committee, in whose behalf these current discussions on planned use (the French I.A.R.U. proposal, the Griffin plan, etc.) are being stimulated. In this connection we solicit further new ideas from other correspondents.

Meanwhile, we present above still another slant on the problem. Obviously, there will be no widespread immediate agreement to this—or probably any other—plan. Yet from the whole discussion some useful thoughts are bound to arise, which can then be made the subject of thoughtful consideration by our planning committee.

Equalizing Voting Power

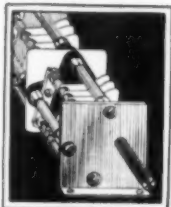
713 St. Louis Ave., East St. Louis, Ill.

Editor, QST:

The A.R.R.L. was primarily intended to be a democratic organization, controlled by its members through a Board of Directors elected by the membership. In theory this is a good set-up for placing control of the League in the hands of the members. But in theory only, in fact the members have very little to do with controlling and deciding the policies of the League.

The unreasonable part of the present arrangement in this apparently democratic organization is the unequal distribution of voting power among the directors. To make this statement clear I point out to you, for example, the director of the Central Division who represents over 4000 members

(Continued on page 62)



ONCE every few years we make a futile attempt to use the broadcast receiver type of construction somewhere in a National Receiver. We should have learned our lesson by now, but broadcast receiver parts cost so much less than ours that we have to reassure ourselves, now and then, that we really are on the right track. For example, a "good" broadcast tuning condenser sells for about a third as much as the labor and materials alone in a PW condenser.

In the NC-80X and 81X we have tried to give as much performance per dollar as possible, and it struck us that the economy would be well worth while if we could use a commercial tuning condenser. We shopped around. One of the best manufacturers in the field agreed to build us a special job with low-loss insulation and other refinements, and we purchased a number of units.

But when the production sets came through it became apparent that these condensers would not do. The ganging was not good enough and backlash was perceptible when using the high selectivity of the crystal on the bandspread amateur bands. We found that by careful refitting these were satisfactory for the NC-80X (which has general coverage ranges) but not for the NC-81X (which has extreme bandspread on the amateur bands.) But this refitting brought the cost up as high as a PW, so what the heck.

This unfortunate discovery was made in October, just when we were starting deliveries. This is why these receivers are so late. NC-81X Receivers (with PW condensers) will be delivered about the time this page is published. In the meantime, we are filling orders for the 80X by using the refitted condensers described above. Later production will employ PW units exclusively. Of course, substituting the more expensive condenser means that the NC-81 is no longer an \$88.00 receiver. However, we have never built a poor receiver and we would rather take a licking than do so. So for the present there will be no price increase.

This account of our troubles is by way of explaining why the deliveries are late. It is not a criticism of the broadcast parts manufacturers, who know exactly what they are doing. The condensers are fine for a set with a maximum selectivity of about 5 KC, but a communication receiver with a maximum selectivity of 320 cycles is something else again, to name just one of the more obvious differences.

It is too bad, though, that broadcast methods will not do. One very clever economy is the way they adjust coils. The coils are wound oversize, and while the impregnating wax is hot, are squeezed with special pliers until the inductance is exactly right. When the wax sets, the inductance remains fixed, — for a while. If you have ever operated a pseudo-communications receiver over a period of months you have probably noticed the steady sliding out of alignment and calibration as the cold flow of the wax allowed the coils to regain their normal shape. It works out very well in broadcast receivers, however, and we only wish it would in ours. It is such a lot cheaper than the exceedingly laborious method that we use, which is to adjust the number of turns with no internal stresses. It is too bad that broadcast methods will not do.

JAMES MILLEN



Use
YAXLEY
APPROVED RADIO
PRECISION PRODUCTS



Play Safe—with YAXLEY Pilot Lights

DON'T run down batteries or run up light bills by leaving equipment turned on!

Don't try to change that final tank coil when it's "hot".

Use Yaxley Pilot Lights to tell you at a glance the condition of your rig.

Your distributor has Yaxley Pilot Lights, at 30c list (less bulb) in four colors of jewels:

Color	Screw Base	Bayonet Base
Amber	310-A	B-310-A
Clear	310-C	B-310-C
Green	310-G	B-310-G
Red	310-R	B-310-R

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
Cable Address—PELMALLO

Use
P. R. MALLORY & CO. INC.
MALLORY
APPROVED RADIO
PRECISION PRODUCTS

Correspondence Dept.

(Continued from page 60)

of the A.R.R.L. and has one vote at the board meetings. The director of the Delta Division represents about 400 members of the League and also has one vote.

Here is a case where 400 men have the same voice in governing the League as 4000. Nothing much democratic about that. I believe a great majority of League members would like to see this condition changed and have a more equal voting power created by either redistricting the present divisions of the League or giving each director one vote for each hundred members he represents.

This change can be brought about in one way only and that is through the directors themselves. It will accomplish nothing bombarding Warner with letters blaming him and all Headquarters for the present set-up. The proper man to spill your ideas on the subject to, is your director. If a majority of the members in your division wish this change made and your director votes contrary to your wishes there is then only one thing to do. Kick that director out by electing a man who will vote the way a majority of the members in your division wish him to.

You League members who would like to see the A.R.R.L. really controlled by the men who pay in the dues and make the organization possible get busy and write your director demanding him to vote for this long overdue and much needed change in the League's Constitution.

—Earl R. Linder, W9DZG

EDITOR'S NOTE.—File No. 129 in the Secretary's File at the Headquarters office is an inch-thick collection of data on the subject of "Reapportionment of A.R.R.L. Divisions." The question is one that has received much attention in the past. The last official actions occurred in 1931 and 1932. The A.R.R.L. Board, at its 1931 meeting, acting upon the suggestion of the Executive Committee, instructed the Committee to draw up a detailed plan for such reapportionment. This was done in the following year and the plan submitted to the Board at its 1932 meeting. At that time it was voted to lay the question on the table, and there it has remained.

Ham Helpfulness

Koch Hospital, Koch, Missouri

Editor, QST:

About a year and a half ago I wrote you a letter asking you if you could help me get some kind of a job that I could do in the hospital in order to get enough money to get together a transmitting outfit. You did not help me get the job but you did see to it that I got on the air. You referred the letter to as fine a bunch of fellows as can be found anywhere—the Order of Brasspounders, Chapter No. 1, St. Louis, Missouri. They supplied me with an SW-3 receiver, 'phones, code practice oscillator and helped me get my ticket. After I got my ticket they supplied me with the transmitter and a converter to supply a.c. for the plates and filaments. They also gave me 135 volts of "B" batteries when power lines here were too noisy for reception last summer. They have given me many other things too numerous to mention by name. Now I find that they have made me a present of one year's subscription to QST. Truly my cup runneth over. . . .

—Waldo E. Good, W9ZND

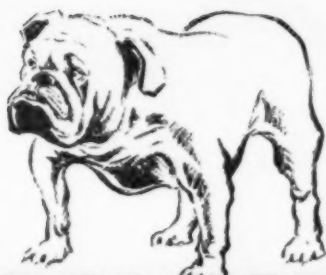
More Ham Helpfulness

2304 Chamberlain Ave., Chattanooga, Tenn.

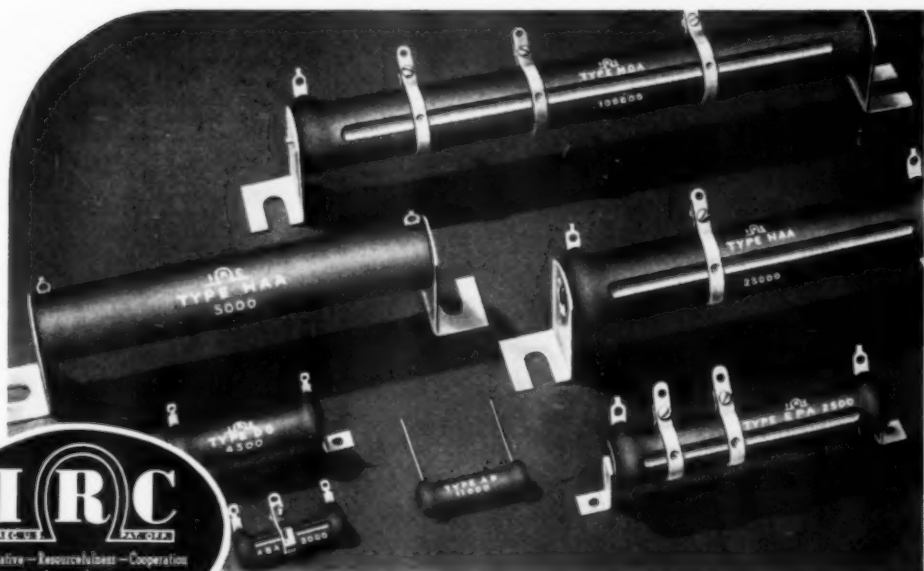
Editor, QST:

Through good fortune and a little forethought, my vacation this year included the VE1 Hamfest at Halifax, Nova Scotia. I took my father, now 82 years old, to see the two remaining members of his generation, my mother's sister in

AS GOOD LOOKING
AS A BULL DOG...



....and **TOUGHER**



Cement Coated TRANSMITTING POWER WIRE WOUND RESISTORS

NO SIR! IRC Cement Coated Wire Wound Transmitting resistors were never designed for beauty. Yet, there is a certain "something" about them — the same beauty you'll find in a prize bull dog. No more. No less! It is the beauty of intense ruggedness — toughness — loyalty — dependability through thick and thin.

In short, IRC Cement Coated Power Resistors are built to do a job. They are built to do it better and longer than any other type of resistor you've ever used before. They stand the overloads. Heat does not crack or deteriorate their tough cement coating. Actual tests show their amazing superiority under moist or salt air conditions. *They will not let you down!*

Made in a complete line of fixed and adjustable types from 100 watts to 200 watts.

INTERNATIONAL RESISTANCE COMPANY

401 NORTH BROAD STREET, PHILADELPHIA, PA.

Factories or Licensees in Canada, England, France, Germany, Italy, Denmark and Australia

MAKERS OF RESISTANCE UNITS OF MORE TYPES, IN MORE SHAPES, FOR MORE APPLICATIONS THAN ANY OTHER MANUFACTURER IN THE WORLD

Say You Saw It in QST — It Identifies You and Helps QST

ANOTHER NEW CARDWELL

TYPE "C" FLEXIBLE INSULATED COUPLING



15,000 V. PEAK FLASHOVER

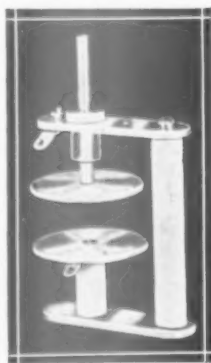
A heavy duty unit for high power variable air condensers or other rotary R.F. units which require dependable insulation from the control mechanism.

- Insulation — No. 196 Alsmag disc $2\frac{1}{4}$ " diameter, $\frac{1}{4}$ " thick. (Losses decrease as frequency increases)
- Maximum overall diameter, $2\frac{3}{4}$ "; special steel cup set screws, heavy N.P. brass hubs, permanently staked into thick nickel plated phosphor bronze springs. As normally supplied, hubs are drilled for $\frac{3}{8}$ inch shaft... but are supplied with 2 extra bushings for $\frac{1}{4}$ inch shaft.
- Three sizes — To fit $\frac{1}{8}$ ", $\frac{3}{8}$ " or $\frac{1}{4}$ " shafts.
- Combinations such as $\frac{3}{8}$ " on one side to $\frac{1}{4}$ " on the other available on special order.

NET PRICE **\$1.68** TO AMATEURS

TYPE ADN

DISC TYPE NEUTRALIZER
for LOW CAPACITY TUBES



Such as T-20, T-55, 100-TH, 35-T, 50-T, HF-100, 800, 834, 852, RK-34, RK-35, RK-18, etc. . . .

Capacity Range:
.5Mmfd. to 4Mmfd.

Alsmag No. 196 pillars; metal parts are satin finish aluminum except for the nickel silver extra long bearing with fine screw adjustment to eliminate wobble. "Easy to get at" double lugs of husky proportions and knurled thumb nut for easy locking.

NET PRICE **\$1.80** TO AMATEURS

**THE ALLEN D. CARDWELL
MANUFACTURING CORPORATION**
83 PROSPECT STREET, BROOKLYN, NEW YORK

Halifax and her brother in Ship Harbor. We had not seen either of them in 45 years.

On the train, we met up with some of the hams en route to the meet, and were welcomed by them enthusiastically. Several cars met the train at Halifax and, with characteristic ham spirit, one car was assigned to seeing that we reached our hotel. Owing to other conventions in progress, that hotel was unable to take us in, so the boys carried us around until we were accommodated. Only someone who has been in such circumstances can understand how much this courtesy was appreciated.

I went to the Nova Scotian Hotel to register on Saturday and, by some chance, happened to be there just as it started with the result that I was the first one on the list. This soon brought many of the hams to look me over, some because of previous knowledge that I was expecting to be there, others to ask of friends in Chattanooga whom they had worked. Foremost among these were VE1DZ and VE1DQ. The latter carried me to be presented to Mr. Alex Reid, Canadian General Manager, who put himself to the trouble of hunting me up several times during the three days to see if I were enjoying myself. They all outdid themselves in courtesies, seating me at the speaker's table at the banquet, with someone always at my elbow to see that I was introduced to others, assigning me to one of the cars in the hidden transmitter hunt, and other expressions of care and thoughtfulness too numerous to mention. I shall always remember that Hamfest as one of the bright spots in my life. Had I been a prominent ham, I could not have been treated with greater consideration.

Of course, all this went to my head, naturally, and I made bold to criticize Mr. Reid's use of the name "American" to distinguish hams of this country from those of Canada. First explaining that my father was a native of Massachusetts, my mother born in Nova Scotia, and being born myself on the Bay of Fundy, I considered that I had a claim to being native to both, I told him that I objected to the use of "American" to only one of the countries. I thought that the Canadians had just as much right to that name as the citizens of the United States. Being the gentleman that he is, as well as the perfect amateur, he took it in the spirit intended and, for the balance of the hamfest at least, he called them "United States and Canadian" hams. Not many men in his position would have accepted such a criticism, let alone be governed by it, from one who was not even a ham himself.

At the meeting of the Chattanooga Amateur Radio Club last night, I was informed by several that they had been told by VE1 hams that I had been to their Hamfest, and they sent best wishes to me in that way—just one more way of being courteous to the stranger within their gates. I would like to tell the world just what the ham spirit is like, and to tell them that anyone with a VE call can consider himself or herself my friend for life.

—W. H. Lord

SWL QSL Bureau

615 Church St., Wisconsin Dells, Wis.

Editor, QST:

. . . With the recent refusal of QSL bureaus to accept listeners cards the SWL QSL problem is becoming worse. Here is the solution I have worked out.

I am setting up a place in Wisconsin Dells known as the "SWL Bureau." All U. S. and foreign amateurs may send their SWL reply cards to the bureau and they will be forwarded by means of self-addressed stamped envelopes, the same as the A.R.R.L. bureau for hams.

This service will be supported by a yearly membership fee of 25¢ from each short-wave listener and will be absolutely free to all amateurs. I have tried to make this fee low enough so it will not look like a money-making scheme and still high enough to offset the expenses of the service. . . .

The number of cards received by the SWL's would certainly increase greatly due to the decreased expense and bother—especially by our foreign ham friends.

It will also be a big financial help to the listener as reply coupons are expensive and few send them anyway. It is not intended to forward QSL's to foreign listeners from W stations at first. If it can be worked out—OK! . . .

—Ross Hansen, W0RBI

ONLY WITH

C.H.T.

TRANSFORMERS

WILL YOUR "RIG" LOOK LIKE THIS



- Streamline case
- Uniform appearance
- Flexible design



A NEAT RIG, O. M.

Only with C.H.T. transformers can you get this uniform "factory built" appearance. Each, from smallest audio to largest plate transformer, follows the same basic design. C.H.T. transformers are built to the highest standards of quality performance.

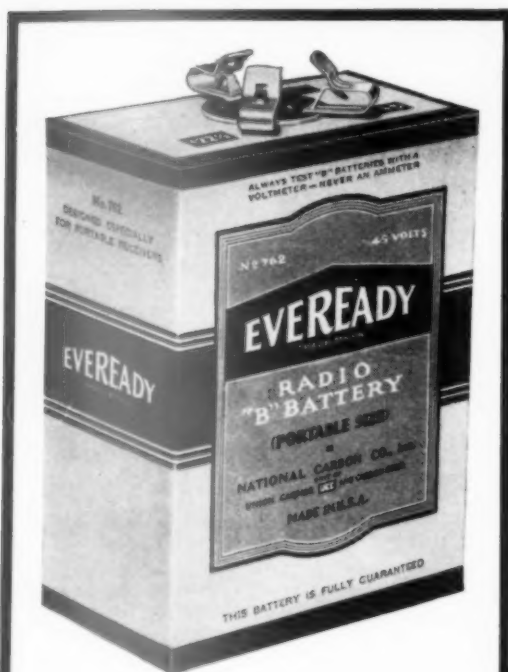
See your parts distributor today for particulars and prices or write factory for FREE Catalog No. 400-A.



THORDARSON ELECTRIC MFG. CO.

500 W. HURON ST., CHICAGO, ILL.

Demand "Power by Thordarson"



"EVEREADY" No. 762 45-volt
Portable "B" battery is now made
with plug-in connection.

Equipped with the RMA standard
3-prong "B" battery socket and
adaptor.

Portable equipment can be powered
with the No. 762 battery when
in the field and easily transferred to
heavy duty batteries for more permanent
locations.

Plug-in connections also make it
easy to shift batteries from one experimental
set-up to another.

NOTE: The No. 762 battery equipped
with screw terminals and insulated
knurl nuts is still available as No. 762-S.

BATTERY HEADQUARTERS

NATIONAL CARBON CO., INC.
30 East 42nd St., New York, N. Y.

*The word "Eveready" is the trade-mark
of National Carbon Co., Inc.*

Radio Amateurs in the Television Picture

(Continued from page 10)

the circuit adjustment, not in the assembling and wiring.

How much will the parts for the vision receiver cost? In the neighborhood of one hundred dollars, everything included. If parts already on hand are worked in, or if an alternative input tuning system is used, the cost may be lower. Then again, if a larger-type tube than a 5-inch or 7-inch size is demanded by the more ambitious, it may cost more. In other words, the price will be on the order of what many amateurs pay for their communication-type receivers.

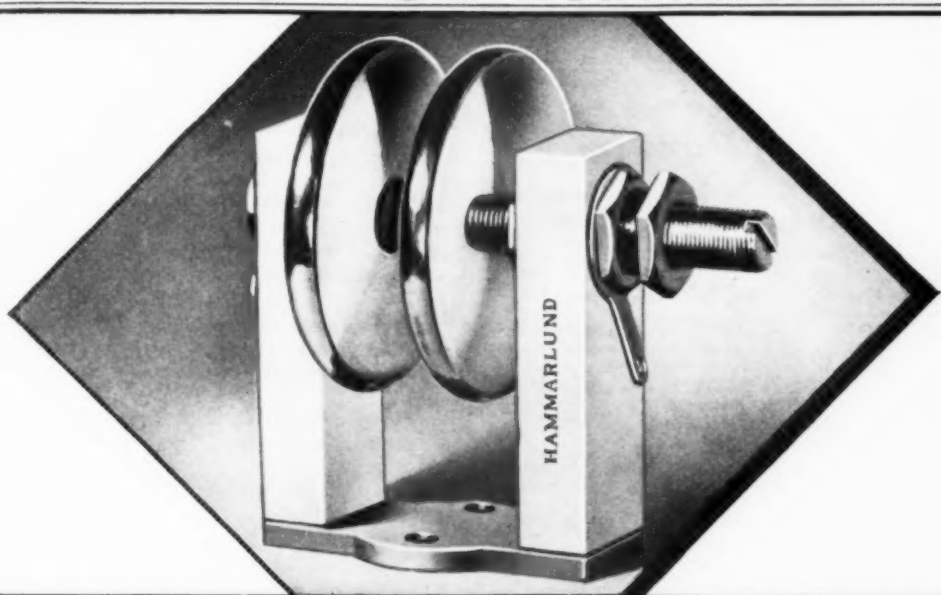
Who will be able to make first practical use of the receiver design, construction and adjustment information? The answer to that is, of course, those within range of a television transmitter. In the beginning, this will mean, generally, amateurs in the metropolitan areas of cities that have experimental television transmitters in operation at the time the receiver articles are completed, which will be late this winter. (A list of cities which now have experimental transmitters and in which transmitters are contemplated for the early future is given in W2KJL's article elsewhere in this issue.) As it happens, the regions in which television signals will be first available are practically the same as those where ultra-high frequency amateur activity has been, and is, greatest. The u.h.f. gang is in a good position to take advantage of that logical coincidence.

How will all amateurs benefit? From the articles themselves, every amateur who is sincerely interested in developing his technical knowledge will profit by reading them and learning thoroughly the lessons they teach. Even though the individual may not be in position to build and make immediate use of a receiver, it will serve him well to make himself as familiar as possible with the practical technique of television. Commercial television executives have stated to us that commercial television broadcasting will demand hundreds of engineers and thousands of servicemen who are familiar with television technique, and that in television, as in broadcasting, amateur radio must be the reservoir of technical personnel.

How can amateur radio contribute to the technical progress of television? Those within range of the experimental transmitting stations will make valuable contributions to the development of television by reporting on the transmissions received, particularly with regard to the signal strength, synchronization under different transmitting conditions, variations in signal-noise ratio. A large number of receivers distributed over a wide area promises to answer one of the most perplexing problems worrying the television people to-day; namely, what is the effective range? They are looking to us to give an answer. We are confident that we can do it.

By such coöperation, we shall continue the traditional proving-ground service to radio development which has played its part in earning

NEW "N-10" FOR NEUTRALIZING



... *by* HAMMARLUND

HAMMARLUND now introduces another exclusive transmitting condenser development — the "N-10" neutralizing condenser! This new condenser, designed for horizontal adjustment, affords easier and safer operation. Thick aluminum plates with round edges are polished over all surfaces. For smooth micrometer control the "N-10" features an oversized fine thread screw with lock nut. A stop is provided to prevent any possibility of shorting. Insulation is B-100 Isolantite. Capacity range is from 2 to 10 mmf., with air gap range from $1/16"$ to $5/8"$. Two-hole base mounting.

Illustrated below are other recent Hammarlund transmitting condenser developments that have rapidly gained the favor of amateurs the world over. For quality transmission, install the new "N-10" along with other precision transmitting condensers by Hammarlund!

Mail coupon for new "38" catalog — just off the press — with details on the "N-10" and other Hammarlund transmitting products!

HAMMARLUND MFG. CO., INC.
424-438 W. 33d St., N. Y. City.

Q-12

☐ Please send me new "38" catalog.

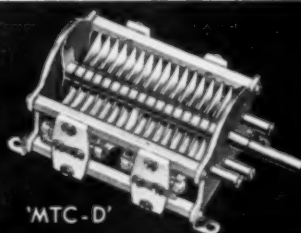
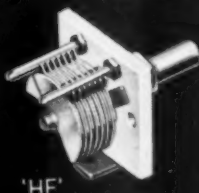
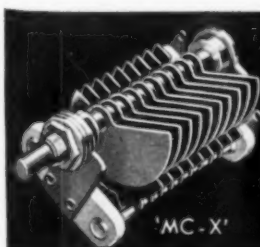
Name

Address

City State



HAMMARLUND



Say You Saw It in QST — It Identifies You and Helps QST



NOW this high-powered radio engineering library

sent to you for 10 days' trial —
at a special price and terms

These books cover circuit phenomena, tube theory, networks, measurements, and other subjects — give specialized treatment of all fields of practical design and application. They are books of recognized position in the literature — books you will refer to and be referred to often. If you are a researcher or experimenter — if your interest in radio is deep-set and based on a real desire to go further in this field — you want these books for the help they give in hundreds of problems throughout the whole field of radio engineering.

RADIO ENGINEERING LIBRARY

— especially selected by radio specialists of McGraw-Hill publications

— to give most complete, dependable coverage of facts needed by all whose fields are grounded on radio fundamentals

For home-study and reference. Contains a revised selection of books culled from latest McGraw-Hill publications in the radio field.

5 volumes, 3064 pp., 2000 illustrations

1. Glasgow's **PRINCIPLES OF RADIO ENGINEERING**
2. Terman's **MEASUREMENTS IN RADIO ENGINEERING**
3. Chaffee's **THEORY OF THERMIONIC VACUUM TUBES**
4. Hund's **PHENOMENA IN HIGH-FREQUENCY SYSTEMS**
5. Henney's **RADIO ENGINEERING HANDBOOK**

Special Low Price and Easy Terms

Bought singly, the five volumes comprising this library would cost you \$25.00. Under this offer you save \$1.50 and, in addition, have the privilege of paying in easy installments beginning with \$2.50, 10 days after receipt of the books, and \$3.00 monthly thereafter. Take advantage of these convenient terms to add them to your library now.

SEND THIS ON-APPROVAL COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N. Y.

Send me Radio Engineering Library, 5 vols., for 10 days' examination on approval. In 10 days I will send \$2.50, plus few cents postage, and \$3.00 monthly till \$23.50 is paid, or return books postpaid. (We pay postage on orders accompanied by remittance of first installment.)

Name
Address
City and State
Position
Company *QST-12-37*
(Books sent on approval in U. S. and Canada only.)

for amateur radio the position it holds to-day. Our coöperation will not revolutionize the advancement of television, of course, any more than our participation in television development will revolutionize amateur radio. But by our constructive coöperation we shall contribute to its progress—while continuing our other activities in full stride.

Introduction to Modern Television

(Continued from page 16)

2. Channel width, 6 megacycles.
 3. Spacing between television and sound carriers, approximately 3.25 megacycles.
 4. Television carrier higher in frequency than sound carrier.
 5. Polarity of modulation, negative or positive.
 6. Number of lines per picture, 441 (interlaced).
 7. Picture or frame frequency, 30 per second; half-frame or field frequency, 60 per second.
 8. Aspect ratio (width to height of picture), 4-to-3.
 9. Percentage of television signal amplitude devoted to synchronizing signal, not less than 20%.
 10. Duration of horizontal impulse, approximately $\frac{1}{10}$ of the time to scan one line; duration of blanking impulse, $\frac{1}{10}$ of the time to scan one half-frame; position of synchronizing impulse, approximately at leading edge of blanking signal impulse. (Average brightness of the picture transmitted by either varying the pedestal height or by d.c. modulation of the output of the transmitter.)
- A simple formula gives the minimum bandwidth necessary in the receiver to obtain satisfactory pictures. This formula is

$$F = 0.64 \frac{A \times N \times n^2}{2}$$

where F = the maximum modulation frequency transmitted, A = the aspect ratio, N = the number of complete pictures scanned per second, n = the number of lines, and 0.64 is a correcting factor to give equal vertical and horizontal detail.⁴

It will be seen from this formula that it is necessary to transmit a sideband approximately $2\frac{1}{2}$ megacycles wide. This means that intermediate frequency stages must pass at least $2\frac{1}{2}$ megacycles with the signal tuned in so that single-sideband reception is approached.

UNITS OF THE TELEVISION RECEIVER

In the block diagram Fig. 7 are outlined the components of a modern television receiver. It consists of four different units. The first contains two power supplies, one for the tuners and sweep circuits, the other to generate high-voltage d.c. to accelerate and focus the cathode-ray beam. The second unit contains a sound receiver which may be a simple ultra-high frequency type. The third unit is the vision receiver, which may be either a tuned r.f. job, if one is comparatively near a transmitter, or a superheterodyne for more effective.

⁴ Kell, Bedford and Trainor, *Television* (RCA Technical Press.)

CENTRALAB WILL STAY QUIET

U. ELGIN CHANDLER
Radio Sales and Service

122 54 Madison Ave.
New York 17, N.Y.

June 9th, 1937

CENTRALAB,
Milwaukee, Wis.

Gentlemen:

The writer first became acquainted with your Volume Controls in 1925, and since that time has used them almost exclusively.

Each time, I have gone back to Centralab, because it is the only control that I have ever found that will stay quiet.

Here in our shop we make every effort to avoid "cath back", and we have found that the use of your volume controls means one hundred percent satisfaction.

Both yourselves and the local servicemen are fortunate in having a distributor who promotes your merchandise as does F. L. Burke & Co., of Louisville.

U. Elgin Chandler

U. Elgin Chandler
U. Elgin Chandler
Radio Sales and Service
Louisville, Ky.



**The Quiet
Centralab
Control**

offers maximum resistor length for
case diameter . . . close uniformity
between resistors . . . accurate tap-
ing . . . uniform current distribution
. . . better power dissipation and
longer life

Fine phrases seldom fool a radio man. Graphs, curves and self-praise may read well . . . but customer complaints put a "negative-bias" on such bouquets.

So, when an "old timer" like Mr. Chandler writes . . . "Since 1925 I've used your controls almost exclusively, in fact each time I have gone back to Centralab, because it is the only control that I have ever found that will stay quiet." . . . we say

"Here's proof for manufacturer . . . for experimenter and for the servicemen." Specify Centralab.

DIVISION OF GLOBE UNION, INC.
MILWAUKEE, WISCONSIN

Centralab

BRITISH CENTRALAB, LTD.
Centerbury Rd., Kilburn
London, N.W. 6, England

FRENCH CENTRALAB CO.
118 Avenue Ledru-Rollin
Paris XI, France

Amperex Tubes deliver

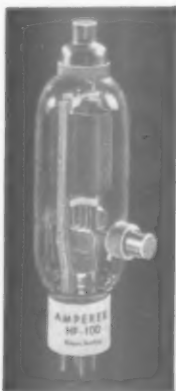
MORE POWER HOURS



Research and testing, then more research and more testing. To the Amperex engineer it's a constant struggle for improvement.

Our engineers make no "compromise" with quality. They do not subordinate the maximum efficiency of a tube to merchandising or ballyhoo opportunities.

Amperex tubes give superior performance . . . last longer . . . and operate economically. That's why we say Amperex tubes give amateurs "truly engineered performance."



HF-100

An ultra-high, normal R. F. power amplifier and oscillator and class B audio amplifier or modulator. Outstandingly efficient in ultra-high frequency circuits.

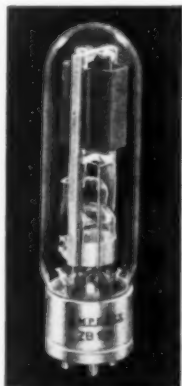
Net Price \$12.50

ZB-120



Low Distortion zero-bias class B amplifier and modulator, high efficiency R. F. frequency multiplying power amplifier, conventional R. F. power amplifier. It approaches nearer the ideal in a zero-bias class B tube and is, in addition a highly efficient performer in many other classes of service.

Net Price \$10.00



AMPEREX

ELECTRONIC PRODUCTS, INC.
79 WASHINGTON ST., BROOKLYN, N. Y.

tive selectivity, flexibility and sensitivity. The fourth unit contains the sweep circuit, the synchronizing signal amplifiers, and the synchronizing signal separating circuit.

The operation of the receiver requires that there be provision for control of the frequency of the line-sweep generator and of the frame-sweep generator, and there must be control of the width of the picture and the height. There also should be controls for determining the picture brightness and contrast, in addition to the sensitivity controls for the sound and the vision receivers. Most of these controls, however, can be set by a screw-driver adjustment and left without attention for long periods.

The tubes, including the cathode-ray tube, in even a simple vision receiver must be designed for the purpose. Few standard receiving tubes are suitable as video-frequency amplifiers because high transconductance and low input and output capacity are required. At present the National Union Radio Corporation is developing such tubes especially designed for the purpose.

It should be pointed out that at this time television signals are being transmitted only on an experimental basis in the metropolitan areas of New York, Philadelphia and Los Angeles; in New York jointly by RCA and the National Broadcasting Company, in the Philadelphia area by RCA, Philco and Farnsworth, and in Los Angeles by the Don Lee Broadcasting System. These transmissions are not at present on consistent schedule; but, before this series of articles is completed, it is expected that transmissions will be more regular. The Columbia Broadcasting System is making an installation on the Chrysler Building in New York, and it should not be long before this transmitter also will be in operation.

Reliable information indicates that experimental television transmitters are also in prospect for Boston, Mass., Albany, N. Y., Bridgeport, Conn., and Kansas City, Mo., with others likely in the near future. Accordingly, no small number of amateurs throughout the country will be in a position to make early practical use of the information contained in this article and in those to follow.

The second article of this series, treating the functional operation of television receiver circuits, will appear in an early issue.—EDITOR.

Strays

W2KR tells how he fearfully looked for a bel-less apartment house when moving into New York City from the country. Finding a good location on Riverside Drive, he nervously asked the manager of the house if it would be all right to have a radio station there. Whereupon the manager said, "Are you a ham? I'm ex-W2AWZ"—and the roof was promptly signed over to 2KR!

— — —

VE2DR thinks the ham station pictured in an ad in the latest call book deserves credit for some startling work. The shack wall shows confirmed contacts with VE7, CM3, XE6, and SMS!

THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER



THE ULTRA SKYRIDER
THE SKY BUDDY
THE SKYRIDER COMMERCIAL



COMPARE! ITS PERFORMANCE.

THE NEW 1938

SUPER SKYRIDER

You really have to sit down and spin the dials of the NEW 1938 SUPER SKYRIDER — actually operate it — before you can fully appreciate how advanced a receiver it is! That's why we want you to hear it in your own shack — and we're willing to bring a New Super Sky rider out for demonstration anywhere within a hundred miles of Chicago, so that you can judge its performance under the actual conditions under which it will operate. Get acquainted with "E and R" service. We check every receiver we sell to assure perfect satisfaction for our customers. Write or phone today for complete information.

★ **\$99⁰⁰**

Less Speaker
Less Crystal

\$111.00 with
Crystal

Matched Speaker P. M. Dynamic **\$12.00**

CHECK THESE FEATURES:

- Over 1000° Band Spread
- 5 to 550 Meters Coverage
- 11 Tubes
- Better than 1 Microvolt average sensitivity
- Wide Range Variable Selectivity
- 5 Meter and Broadcast Band

ALL HALLICRAFTERS RECEIVERS AVAILABLE ON LIBERAL TERMS

ELECTRIC and RADIO SUPPLY CO. ★

25 NO. FRANKLIN STREET

CHICAGO, ILLINOIS

the hallicrafters inc.

THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER



THE ULTRA SKYRIDER
THE SKY BUDDY
THE SKYRIDER COMMERCIAL

IT CAN'T BE BEAT!★



★ THE NEW 1938 SUPER SKYRIDER

No wonder the New 1938 Super Sky Rider has taken the Amateur Radio world by storm. It's got everything — Sensitivity, better than 1 microvolt average on all the bands — Wide Range Variable Selectivity, razor-sharp to broad high fidelity — Complete coverage, 5 to 550 meters — Everything from the 5 meter band to the top of the broadcast band and a 1000-degree Electrical Band Spread of spectacular new design and performance.

The New Super Sky Rider is advanced in conception and engineering — it must be seen and operated for full appreciation. So stop in at the Harvey Radio Co. — look over the amazing new Super Sky Rider, or write for complete information.

FEATURES:

- 5 to 550 Meters Continuous Coverage
- Better than 1 Micro-volt average sensitivity
- Improved Expanding IF Transformers
- Over 1000° Band Spread
- "S" Meter
- 5 Meter and Broadcast Band
- 11 Tubes
- 6 Bands
- Wide Range Variable Selectivity

NOW AVAILABLE ON EASY PAYMENTS

HARVEY RADIO CO.

103 WEST 43RD STREET, NEW YORK CITY

Cable Address "HARRADIO"

the hallicrafters inc.

\$99.00

Less Speaker, Less Crystal

\$111.00

With Crystal

\$12.00

Matched Dynamic Speaker

First LICENSED TRANSMITTER

The AIRLINE

LICENSED
BY R.C.A.
BUILT BY
THE HALLICRAFTERS

\$97⁰⁰
CASH
PRICE

TERMS AS LOW AS
\$9 DOWN
\$8.00 A MONTH

- 60 Watts C. W.—15 Watts 'Phone
- Five Bands—10, 20, 40, 80, 160
- Very Efficient on High Frequencies
- No Larger than Average Receiver

*Everything
Sold on
MONTHLY
PAYMENTS*

So good it is the first Amateur Transmitter to be licensed by R. C. A. Incorporates the very latest engineering developments. Mechanical construction and parts in keeping with its efficient electrical design. Priced to save you many dollars and sold on convenient Monthly Payments, of course — like all Ward's equipment.

Stop in at any of the 500 Ward stores and ask about the new Airline Transmitter — or mail the coupon today for Ward's new 1938 radio catalog in which this new transmitter is fully described.

MONTGOMERY WARD

Montgomery Ward, Dept. RA-2, Chicago, Ill. Please send me a copy of Ward's new 1938 Radio Catalog describing the new Airline Transmitter.

Name _____ Street _____

City _____ State _____

Say You Saw It in QST — It Identifies You and Helps QST

73



THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER



THE ULTRA SKYRIDER
THE SKY BUDDY
THE SKYRIDER COMMERCIAL

THE RECEIVER THEY'RE ALL TALKING ABOUT!



THE NEW 1938 SUPER SKYRIDER

\$99.00

Less Speaker
Less Crystal

On the air, at the ham-fests, everywhere that amateurs get together, you hear about the Hallicrafters New 1938 Super Skyrider. Through genuine merit and advanced engineering this remarkable new receiver has created a wave of enthusiasm as hundreds of amateurs install them in their shacks. It has everything needed for better reception of the entire radio spectrum from 5 to 550 meters.

Come in to see the New Super Skyrider — let "Mort" point out its many exclusive features and demonstrate its marvelous performance. You'll like M and H personalized service.

FEATURES

- ★ 1000° Band Spread
- ★ 11 Tubes
- ★ 5 to 550 Meter Average
- ★ Wide Range Variable Selectivity
- ★ Better than 1 Microvolt average sensitivity
- ★ 6 Bands including 5 Meter Band and Broadcast Band
- ★ Improved Expanding I F Transformer

NOW AVAILABLE ON EASY TERMS

M & H SPORTING GOODS CO.

512 Market Street

PHILADELPHIA, PENNSYLVANIA

the hallicrafters inc.

THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER



THE ULTRA SKYRIDER
THE SKY BUDDY
THE SKYRIDER COMMERCIAL

HERE'S GOOD NEWS!



YOU CAN BUY ANY HALLICRAFTERS RECEIVER ON HINDS & EDGARTON EXCEPTIONALLY LIBERAL TIME PAYMENTS

WHY NOT ENJOY the marvelous performance of a new 1938 Super Sky Rider—the most modern of all communications receivers—now? You don't need to wait until you have the full cash price—a small down payment will bring your Super Sky Rider—the balance you pay on Hinds and Edgerton easy monthly payments—so low you'll never miss them.

You'll enjoy your relations with Hinds and Edgerton. We guarantee satisfaction and you'll get Hinds and Edgerton personalized attention. In Chicago, we are in excellent position to give you real service. Our customers are our friends and we treat them as such.

Mail in the coupon today! Let us send you complete information on the new Hallicrafters receivers and full details on Hinds and Edgerton Easy Time Payment Plan.

The NEW 1938 SUPER SKYRIDER

FEATURES

- Over 1000° Band Spread
- 5 to 550 Meters Coverage
- 5 Meter and Broadcast Band
- 11 Tubes
- Wide Range Variable Selectivity
- Better than 1 Microvolt average sensitivity

\$99.00

Less Crystal and Speaker

With Crystal **\$111.00**

P. M. Dynamic Matched Speaker **\$12.00**

MAIL
THIS
COUPON
TODAY

W9APY

HINDS & EDGARTON
19 SOUTH WELLS STREET, CHICAGO, ILL.

W9WR

Please rush me complete details of New Super Sky Rider and Hinds and Edgerton Time Payment Plan.

Name..... Call.....

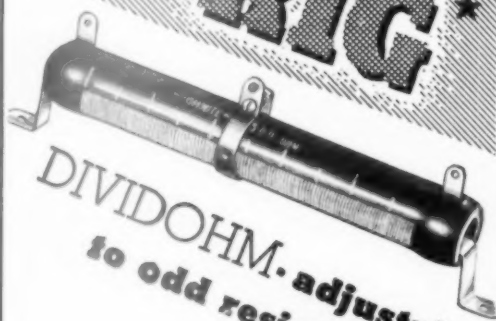
Address..... City..... State.....

the hallicrafters inc.

TO SQUEEZE

the most out of your

RIG ★



DIVIDOHM adjustable
to odd resistances ★

THESE adjustable resistors are ideal for bleeders or voltage dividers or wherever a reliable high-wattage adjustable resistor is necessary. The resistance wire is accurately space-wound over a porcelain core which forms a solid surface against which the contact button may press. About four-fifths of the core is then covered with time-proven vitreous enamel, protecting the unit against mechanical or electrical injury. A patented percentage-of-resistance scale makes it easy to set the adjustable lug.

OHMITE
MANUFACTURING CO.

4831 W. Flournoy Ave., Chicago, U. S. A.

An Improved Dual-Diversity Receiver for High-Quality 'Phone Reception

(Continued from page 21)

Attached to the shaft of the tuning knob is a heavy four-inch cast-iron fly wheel, the purpose of which is to allow the dials to be spun by a quick twist of the knob, thereby avoiding the tedious business of having to turn the tuning knob 35 times to go from one end of the main dial to the other. With this arrangement two or three quick flips on the knob will spin the tuning dials rapidly over that complete range.

PANEL ARRANGEMENT

The meter on the left-hand side of the receiver is a zero-center type reading 50 ma. either side. Its purpose is to check the operations (particularly to equalize the gain) of the two receiver circuits. It is connected in a balanced bridge circuit in such a manner that when the gain of one receiver practically equals that of the other, the meter will read zero. Below the meter are three knobs. The center knob is the master r.f. gain control. The knobs to its right and left are the gain controls for the i.f. amplifiers of circuit "A" and "B," respectively. With the key switch to the left of the meter in its center position, both receivers work in diversity; and when thrown up or down it switches either receiver to work independently. Of the controls near the bottom of this same panel, that at the right is the variable infinite-rejection control for circuit "A." Next to it is the power factor corrector resistor for this circuit. Alongside this is the 'phone jack, which is connected across the output of a 500-ohm line transformer. Approximately 300 milliwatts is the maximum output available from the first audio stage. On the extreme right hand panel is located the signal intensity meter which will read either the signal intensity of receiver "A" or "B" separately, or the signal level for the combination in diversity. This meter is in the circuit of the d.c. vacuum-tube voltmeter connected across the combined diode load. The two key switches are for c.w.-'phone operation and stand-by (send-receive) switch. The standby switch has a locking and non-locking position. Below the meter is the master audio gain control. The other knobs are for audio tone control and c.w. pitch control. Below these controls are the infinite rejector controls for circuit "B." Alongside of these controls is the a.c. switch for turning on and off the receiver, operating on the power supplies of the two separate units.

PRACTICAL RESULTS

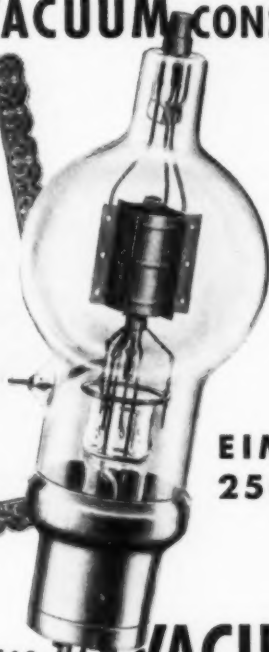
The small unit with two meters, shown on top of the receiver, is the diversity meter box. With the set operating as a diversity receiver, these meters show at a glance the fading effects in the two separate circuits. Under normal conditions in long-distance high-frequency reception they will vary up and down, from zero to plus 9, very rapidly. The interesting point is that very

EIMAC HAS MADE THE INDUSTRY VACUUM CONSCIOUS

GUARANTEE

No injury to the operation of Eimac tubes will result from gas released from either the plate or grid assembly during a short accidental or intentional dissipation overload.

EITEL McCULLOUGH, Inc.
San Bruno, California



EIMAC
250TH

Your tube is no better than its VACUUM!

Long filament life . . . uniformity of characteristics . . . outstanding performance and *Complete Freedom from Failure Caused by Gas* depend entirely upon one important factor . . . *Vacuum*.

Obviously the material of which the elements are fabricated has a direct bearing on vacuum. Eimac uses Tantalum because this material has a very low initial gas content, and when properly handled can be completely degassed. Gas content of Tantalum is but 1/10 that of molybdenum and only 1/1000 that of conventional carbon anode. While Tantalum has many advantages, its use alone does not necessarily produce a better tube. This material requires expert handling to get full advantage from its peculiar properties. Eimac engineers developed an exclusive process (patent pending) for the fabrication and exhaust of their tubes. That's why Eimac tubes are guaranteed never to fail because of gas released internally.

Eimac disproves the popular fallacy that anode temperature affects emission. In conventional tubes, high anode temperature releases

gas that should have been removed in the original exhaust. This gas is what affects . . . or poisons . . . filament emission. The temperature of the anode in an Eimac tube will never affect filament emission because the gas has been properly removed. Eimac tubes are conservatively rated as to plate dissipation. Momentary overloads of 400% to 600% which is sufficient to cause the anode to become incandescent will positively not release gas.

Ceramics as used for vacuum tube insulators are incapable of complete evacuation and therefore are a potential source of gas. Since Eimac tubes have no internal insulators this source of gas is entirely eliminated. The proper use of Tantalum . . . the elimination of all internal insulators . . . plus a severe exhaust on high speed diffusion and oil pumps, produces a better and more dependable vacuum than can possibly be obtained by the use of a chemical agent or "getter." Eimac uses no "getter."

Try Eimac Tubes in your transmitter and you'll agree that the use of the more expensive materials, the long severe exhaust and the unique construction produce outstanding results.

Eimac
TUBES

EITEL & McCULLOUGH, INC. • San Bruno, California

★ "Best
Communication
Receiver in Use
Today... NEW
SUPER-PRO"



★ "THERE is nothing on the market that can compare with this new receiver," says Charles W. Eggenweiler, Los Angeles, California. Mr. Eggenweiler adds, "The new 'Super-Pro' is very quiet and selective. The splendid Hammarlund workmanship and engineering has made it the last word in receivers. On 10 meters, it beats anything I have ever tried."

Countless others are likewise applauding this distinctive receiver with such outstanding features as — two stages of R.F. on all bands, including the 20-40 mc. band providing an average sensitivity of 0.85 micro-volt (30% modulated) with a signal to noise ratio of 6 to 1! The image rejection ratio is so high as to provide complete freedom from "two-spot" tuning except in exceedingly rare instances, viz., at 28 mc. the ratio is 150 to 1; at 7 mc. — 10,000 to 1.

Other features are — four air tuned I.F.; electrostatically shielded input; electrical band spread; variable band width (3 to 16 kc.) panel control; direct tuning; stand-by switch; relay terminal strip; variable crystal filter, etc. Crystal or standard models for table or rack mounting, or new console for 7½ to 240, 15 to 560, or 15 to 2000 meters. Mail coupon for further details!

MAIL COUPON TODAY

HAMMARLUND MFG. CO., INC.
424-438 W. 33 Street, N. Y. C.

☐ Please mail me "Super-Pro" bulletin.

Name.....

Address.....

City.....State.....

Q-12



CANADIAN OFFICE: 41 WEST AVE. N.
HAMILTON, ONTARIO

HAMMARLUND

seldom will they both vary either upward or downward together. In fact, they give the illusion of being oppositely geared together, for when one pointer goes up, the other will almost invariably drop down, or *vice versa*.

The signal meter on the main panel of the set, at the right, indicates the average combined signal level. The three meters together give a pretty conclusive visual indication of the diversified fading that goes on in the field of two antennas separated but a relatively short distance apart. The diversity meters indicate what each receiver is doing at each instant and the third (combined) meter indicates the resultant output of the two receivers, thus graphically showing the improvement accomplished by diversity reception; for invariably, when the diversity meters are swinging up and down with great rapidity, the combined meter will vary but a slight percentage of the variation afflicting either of the other two.

An interesting check on the benefits of diversity reception in improving signal-to-noise ratio, as well as in the reduction of fading, is to tune in a long-distance high-frequency-broadcasting signal at a time it is subject to deep fades and, after listening for a while with diversity, switch one receiver off and notice the aural as well as the visual difference on the third signal-intensity meter. Such a test shows pretty conclusively that the amateur, with antennas not any more complicated than he is now using and strung up but a wavelength or so, can derive worth-while benefits from this interesting and improved method of reception.

Where possible, it is recommended that the two antennas be put up a hundred feet or more apart with balanced transmission lines feeding the two receivers. We have observed considerable improvement in reception, with striking visual proof of diversity action on the diversity meters, even when two antennas running parallel one above the other and separated only ten feet were used. However, where two antennas have to be placed very close together it is recommended that they be placed at right angles to each other or in different planes to each other, one horizontal and the other vertical.

In addition to reducing fading effects, diversity reception also reduces heterodyne interference in the reception of amplitude-modulated ('phone) signals.⁴ This may be considered as a species of phase selectivity peculiar to the diversity system, irrespective of its frequency selectivity characteristic. When the audio frequency outputs representing the envelopes of two modulated signals are combined in the audio load circuit, they will add arithmetically. However, beat-frequency heterodyne products from an interfering carrier will add up vectorally. Hence, with the dual-diversity system the interference-to-signal ratio will, at worst, be the same as with a single receiver when the heterodyne outputs of the two detectors are in-phase aiding and of equal amplitudes. Under all other conditions, the beat-note

⁴ J. J. Lamb, "Interference and Noise Reduction in Communication-Type Receivers," *Proc. Radio Club of America*, Nov., 1936.

Just Issued . . .

Building an Amateur Radiotelephone Transmitter

An introduction into Amateur Radiotelephony. Written for the man who has a Class C or Class B license. A companion book to "How to Become a Radio Amateur."



CONTAINS simple description of the process of modulation and principles of good design for 'phone. Description of inexpensive low-power transmitter and modulator, with complete operating instructions plus some antenna dope of particular interest in 160- and 10-meter operation. It tells what a new or inexperienced ham should know before attempting to use 'phone.

25 CENTS
POSTPAID
(no stamps, please)

American Radio Relay League, Inc.
WEST HARTFORD . . . CONNECTICUT

Say You Saw It in *QST* — It Identifies You and Helps *QST*



Mr. Raymond P. Adams, well known West Coast radio engineer and designer

The Designer of the Orthotech All-Wave Set Says:

"None but the Best for Me"

Bellwood, California
August 24, 1937

JEFFERSON ELECTRIC COMPANY,
Bellwood,
Illinois.

Gentlemen:

In my particular line of activity—the design, development, and description of special radio and communications equipment using standard parts—I find it unquestionably imperative to depend upon none but the very best audio and power components.

Over a period of some years in this work, it has been my privilege to become intimately familiar with JEFFERSON transformers and chokes, to employ various JEFFERSON items in the development of better class designs, and to recommend and specify these parts to friends and to readers of my articles; and I think it high time that I complimented you on the unusually high quality and efficiency of the line as a whole.

Their very moderate cost notwithstanding, your components are in my estimation among the best in the field. They are durably and ruggedly constructed, closely and attractively finished, built to withstand such usage and abuse and to hold ratings in these ratings, unit after unit, and remain consistently consistent in these ratings, unit after unit—implying perfection of manufacture. I particularly like your practice of using ample material in the construction of even the least of these items—and your policy of rating power transformer output in terms of 90 into a specific value of input filter capacity. The line is complete, and, if I am any judge, should appeal as such to the critically-minded amateur as to the professional engineer and technician.

Very truly yours,

Raymond P. Adams
RAYMOND P. ADAMS.



No. 467-451—Transformer for Class B Driver

Jefferson Transformers are all liberally proportioned and combine all the experience, skill and knowledge of transformer engineering gained through the manufacture of transformers since radio's inception.

The characteristic of each type is accurately set up and proved in laboratory and field operation.

Get Complete Catalog
and New Amplifier
Circuit Diagrams—
Free



To insure the greatest satisfaction—be sure to insist on "Jefferson." Your Parts Jobber can supply you or get any particular type you require. . . . Send the attached coupon for free complete catalog and set of new amplifier circuit diagrams. . . . JEFFERSON ELECTRIC COMPANY, Bellwood, Illinois. Canadian Factory: 535 College Street, Toronto, Ont.

JEFFERSON RADIO TRANSFORMERS

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois

Mail latest catalog 372-R and your free manual of new amplifier circuit diagrams to:

Name _____

Address _____

City _____

State _____

products will cancel each other more or less. The combined beat-note output may be reduced to zero when the separate beat-note products are of equal amplitude and opposite phase. Since the relative phase of the interfering heterodyne outputs of the two detectors depends on the radio-frequency phase relationship at the inputs to the receiver, and since this relationship is likely to shift continually, the average heterodyne interference is considerably reduced. This accounts for reports from Dr. Hard that heterodyne interference is largely alleviated with his diversity receiver.

An incidental use of dual-diversity reception, pertinent to amateur experiments, is in showing up instantaneously the efficiency and directional properties of two different types of antennas over a range of frequency bands. It is often observed that on some signals one antenna "does all the work," while on other signals the other has the higher signal level. This application is of value in comparing antennas for different directions and frequency bands.

In conclusion, it can be stated that the single-control dual-diversity receiving system does four important things. First, it eliminates or reduces to a marked extent bad fading in long-distance high-frequency reception. Second, it gives an average increase in signal strength beyond that obtainable with any single receiver. Third, the signal-to-noise ratio of the two receivers in combination is better than with one receiver alone. And fourth, it reduces heterodyne beat note interference to a noticeable degree.

Description of a modulation system for diversity c.w. telegraph reception has not been included in this article. As was explained in the previous article on this type of receiver, it is impossible to use a beating oscillator, as is common practice in single-receiver circuits, because of the heterodyne cancellation which would take place at the output. We have been working on several methods, including modulating the h.f. oscillator with an audio tone, which show promise of getting around this difficulty. But, as frequently occurs in the early development stage, unfortunately there are bugs. We'll give you the story when it is perking properly.

Low-Power Contest Results

(Continued from page 21)

from 96 QSO's. This is the highest score in the "home station" group and was made by two operators, VE3GT and VE3BC. Operation was on 3.5, 7 and 14 Mc. Transmitter power came from the a.c. mains, receivers were run from d.c. In fifth place is a single-operator home station, W6NLZ. . . . 90 QSO's, 150 points. He also chose to use a.c. power sources for the transmitter, self-power for the receiver. A separate rig was used on each band—3.5, 7 and 14 Mc.

The various stories told by those taking part closely parallel the June Field Day experiences, which were quite fully given in November QST,

YES THERE IS A Santa Claus

YOUR RADIO PARTS DISTRIBUTOR



He's YOUR Radio Parts Distributor, serving you every day of the year. Your Radio Parts Distributor cheerfully gives his time and attention to YOUR problems. His stock of excellent radio gear makes his store a veritable sleigh load of values. Yes sir, he's an honest - to - gosh Santa Claus to every Ham who knows him. We are as proud of our Distributors as you are. They represent the cream of the industry. We acknowledge their acclaims, and the praise of all amateurs, who know Taylor Tubes' "More Watts Per Dollar" value. Taylor Tubes and Taylor policies are built on customer satisfaction and four square dealing. We sincerely appreciate the compliment of top sales that you, the amateur, and our mutual friend, your Distributor, have given us during 1937. Our hats are off, as are those of the Amateur, to the Amateur Radio Parts Distributor — *Long may he serve.*

**TAYLOR TUBES EXTENDS HEARTIEST
★ SEASON'S GREETINGS ★**

Warren Taylor

Frank Hajek, W9ECA

Rex Munger, W9LIP



"More Watts Per Dollar"

Taylor

HEAVY

**CUSTOM
BUILT**

DUTY

Tubes

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS

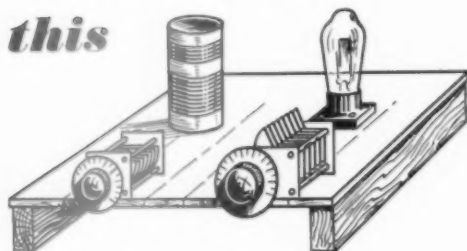
Say You Saw It in QST — It Identifies You and Helps QST

Say!

RADIO AMATEUR

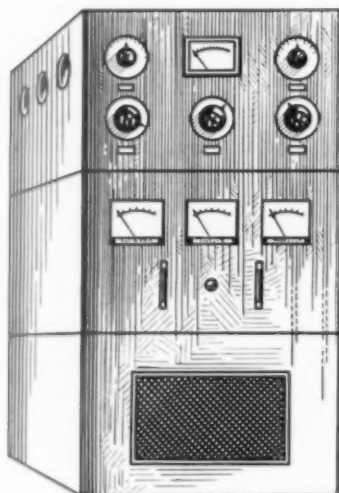
WHETHER YOU USE

this



OR

this



Your right to put
it on the air is
defended by your

A.R.R.L.

ARE YOU A MEMBER?

Board of Directors

so we will not go into great detail again here. However, a few notes taken from the various reports may prove of interest: "Sure surprised at the good signals most of the low power rigs had. Compared very favorably with 100 and 300 watt rigs."—W5DYH. . . . W6JWY used 1.75-Mc. 'phone entirely, working 48 stations. . . . "Called 34 stations and worked 25—not bad for 16 watts."—W8LDA. . . . W9TDR used but 2.28 watts, apparently the lowest powered station in the contest. . . . Conditions (both radio and weather) were reported bad in many quarters. . . . All but one of W9FUH's 74 QSO's were on 14-Mc. 'phone. . . . There is no rest for a ham—W3DOD and W3GXA were aroused from their sleep in the early morning hours to re-erect the mast which came thundering earthward at W4BRB-4. . . . About 50% of the operation at W6KBB-6 was on 56 Mc. 'phone. . . . A near emergency existed for some of the boys out in the open when the rain started to come down by the buckets-full—it seemed that they would have to make real emergency use of their sets. . . . Input at W8JA-3 varied between 3.5 and 4.8 watts. . . . Only 3 watts input at W8KO-8. . . . 19 contacts were made on 14-Mc. 'phone at W2KR-2. . . . W6NRE's work was all on 1.75-Mc. 'phone. . . . 4 watts input at W1JAH. . . .

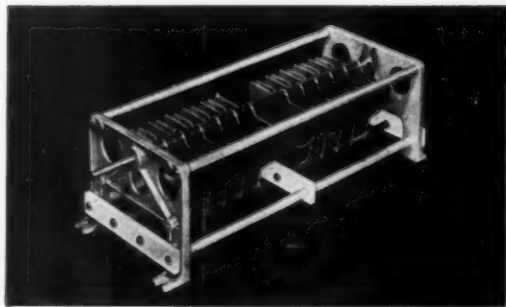
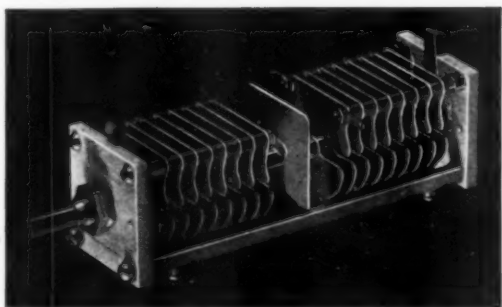
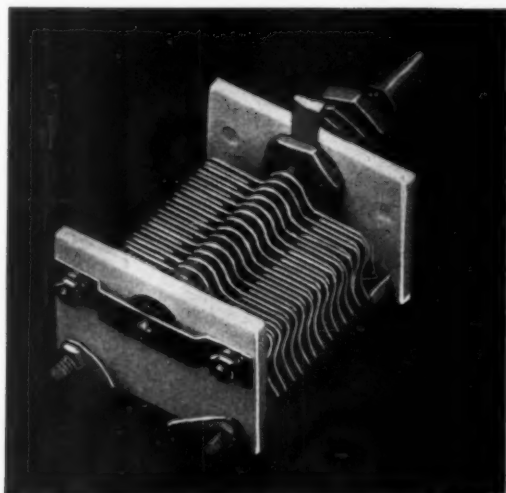
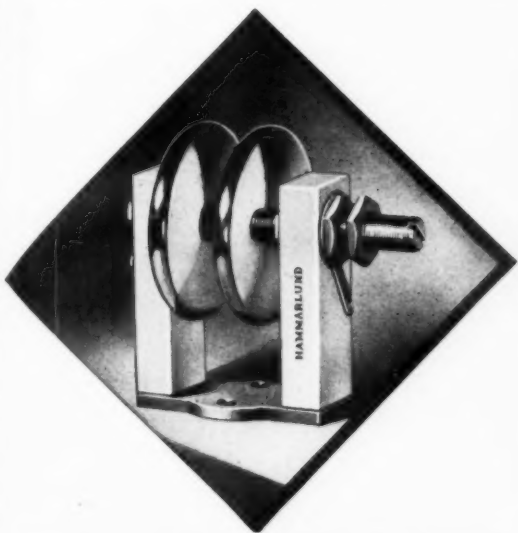
Like the Field Day in June, the August Low Power Contest provided another test for emergency/portable apparatus. We are now coming into the season when many of us may be called upon to use our auxiliary gear in actual emergencies. Are you ready? Participation in the F.D. and L.P. contests help prepare us for these emergencies. Plan now to get into all such activities in the future. You'll have a lot of fun at the same time you do something worth while!

—E. L. B.

LOW POWER CONTEST SCORES

HOME STATIONS		QSO's	Score*
Station	Operators		
VE3GT	VE3BC-VE3GT	96	159 R
W6NLZ	W6NLZ	90	150 R
W9TOP	W9TOP	53	126 RT
W9RQM	W9RQM-W9SJF-W9RLB	73	124.5 R
W6OFQ	W6OFQ	50	100 RT
W5DBR	W5DBR	49	98 RT
W5FH	W5FH-cxW5BRY (log keeper)	50	97.5 RT
W1BFT	W1BFT	30	80 RT
W9AHA	W9AHA-W9CMB	41	76.5 R
W8LCN	W8LCN	41	76.5 T
W5FZG	W5FZG-W5EKK	40	75 R
W1AUN	W1AUN-W1KIK	37	70.5 T
W1JAH	W1JAH	21	62 RT
W5DYH	W5DYH	48	58
W5ABN	W5ABN	44	54
W2EIL	W2EIL	33	50.5 RT
W1ABG	W1ABG	15	50 RT
W6JWY	W6JWY	48	48
W3GHM	W3GHM	38	48
W4COV	W4COV	38	48
W5EGP	W5EGP	48	48
VE3WD	VE3WD-VE3RO	23	46 RT
W1JYW	W1JYW	30	40
W8QHx	W8QHx	33	33
W8OYY	W8OYY	11	31.5 R
W6NRE	W6NRE	21	31
W8PSR	W8PSR	30	30
VE5UK	VE5UK	10	30 R
W3FPQ	W3FPQ	15	25
W4EPT	W4EPT	15	25

LEADING MANUFACTURERS SPECIFY ISOLANTITE



Photos courtesy of Allen D. Cardwell Manufacturing Corporation, Hammarlund Manufacturing Company, Inc., and National Company, Inc.

Leading manufacturers of variable condensers select Isolantite* for end support and base insulation—because Isolantite has been shown, by laboratory test and practical performance, to possess *all* the desirable characteristics of a high quality ceramic insulation. Typical of the condenser applications in which Isolantite is liberally used are Cardwell's Single Trim-Air Type ZU-140-AS and Dual Trim-Air Type ET-30-AD; National's heavy duty transmitting condenser Type TMA, and Hammarlund's new Type N-10 neutral-

izing condenser, just placed on the market.

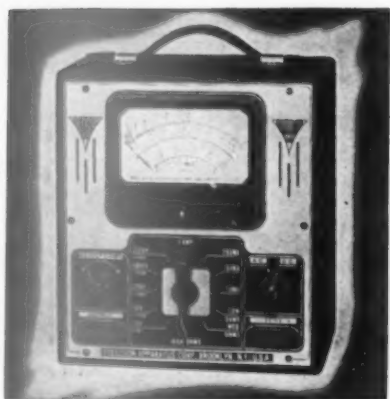
For the amateur, Isolantite ceramic insulators offer the same advantages that have recommended them to manufacturers of commercial equipment who demand an insulator high in mechanical strength and precision, low in dielectric losses and moisture absorption.

ISOLANTITE INC.

CERAMIC INSULATORS

Factory: Belleville, New Jersey • Sales Office: 233 Broadway, New York, N. Y.

*Registered Trade-name for the products of Isolantite Inc.



'PRECISION'

SERIES 840L A.C.-D.C.
VOLT-OHM-DECIBEL-MILLIAMMETER
including a

**2500 VOLT A.C. and D.C. RANGE
and a 1000 M.A. RANGE**

SPECIFICATIONS

★ 5 A.C.-D.C. Voltage
Ranges from 0 to 2500
volts at 1000 ohms per
volt.

★ 4 D.C. Current Ranges
from 0 to 1 amp.

★ 5 Output Ranges.

★ 3 Resistance Ranges from
0 to 10 megs. (provision
for self-contained bat-
teries).

★ 5 Decibel Ranges from
-10 to plus 63DB.

Net price
to amateurs

\$19.95

Less batteries
and test leads



New "PRECISION" New

SERIES 830
D.C. VOLT-OHM-MILLIAMMETER

SPECIFICATIONS

★ Five D.C. voltage ranges
at 1000 ohms per volt:
0-10; 0-100; 0-250; 0-
500; 0-1000 volts.

★ Four D.C. current ranges:
0-1; 0-10; 0-100; 0-250
MA.

★ Two resistance ranges:
Low ohms (shunt method)
0 to 500 ohms. High ohms
0-300,000 ohms.

★ Ohmmeter ranges are pow-
ered by self contained
supply.

Net price
to amateurs

\$10.95

Furnished with
self contained battery

Write for our new No. 38 Catalog. See these and
other PRECISION instruments at your jobber.

PRECISION APPARATUS CORP.

821 EAST NEW YORK AVENUE
BROOKLYN, NEW YORK

W8LDA	W8LDA	25	25
W2GVZ	W2GVZ	6	24 T
W9VOD	W9VOD	24	24
W1JTD	W1JTD	12	22
W6AAI	W6AAI	20	20
VE3ACB	VE3ACB	20	20
W4APU	W4APU	19	19
W9FWG	W9FWG	7	17
W8CZ	W8CZ	13	13
W9TDR	W9TDR	8	16 RT
W3FSP	W3FSP	12	12
W8KZL	W8KZL	8	12 R
VE3LI	VE3LI	11	11
VE4VJ	VE4VJ	9	9
VE2GZ	VE2GZ	8	8
W1JLG	W1JLG	6	6

FIELD STATIONS

W2DKJ-2	W2DKJ-W2JHV-W2IGK	107	234 RT
W9PWU-9	Central Colorado Radio Association ¹	76	172 RT
W8IFD-8	W8OBP-W8QQE-W8IFD	70	160 RT
W4CDC-4	Chattanooga Amateur Radio Club ²	62	144 RT
W9FUH-9	W9FUH	74	131 rt
W6KXS-6	W6NSC-W6OKL-W6KXS-Ralph Dow (cook)	53	126 RT
W2KR-2	Northern Nassau Wireless Associa- tion ³	58	116 RT
W4BRB-3	W3DOD-W3GVO-W3GXA-W4BRB	38	96 RT
W8CFR-8	Amateur Transmitter's Assn. of W. Pa. ⁴	36	92 RT
W6KBB-6	W6KBB-W6JRZ	45	90 RT
VE3KM	Hamilton Amateur Radio Club ⁵	58	87 R
W9SFZ-9	W9SFZ-W9KXJ-W9FND	43	86 RT
W3BKQ-3	Chester Radio Club ⁶	38	76 RT
W8KO-8	W8KO	26	72 RT
W3BGD-3	Beacon Radio Amateurs' Club ⁷	33	66 RT
W8JA-3	W8JA	15	50 RT
VE3SY	VE3SY	25	50 RT
W2AHC-8	W2AHC	14	48 RT
W9HHT-9	W9YNR-W9OMG-W9HHT	24	48 RT
VE3BY	VE3AJB-VE3BY	14	48 RT
W7GDB-7	Butte Amateur Radio Club ⁸	31	41
W5ABQ-5	W5ABQ	14	28 RT
W9NGG-9	Starved Rock Radio Club ⁹	16	27 Rt
W9RSL-9	High Frequency Communications Assn. ¹⁰	11	22 RT
VE4ABM	VE4ABM-VE4AF	10	20 RT
W2HLB-2	W2HLB-W2HTQ	19	19

* An R after the score indicates that receiver was self-powered; T indicates that transmitter was self-powered. No indication means that power was secured from the public mains. Where self-power was used part of the time, this is indicated by an r or t.

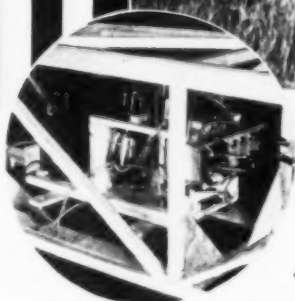
Club operators: ¹ W9OKH, W9PWL, W9PWU, L. R. Ware (log keeper), Mrs. W9OKH (cook). ² W4CDC, W4DUS, W4EXK, W4PL. ³ W2AOL, W2AYJ, W2AZS, W2DDU, W2DUA, W2DXO, W2FMC, W2GZS, W2HQJ, W2KR. ⁴ W8BSO, W8CUG, W8NXD, W8AVY, W8CFR. ⁵ VE3PO, VE3VZ, VE3GZ, VE3KM, VE3AFA, VE3IA. ⁶ W3DGM, W3ATK, W3CWQ. ⁷ W3ATR, W3BZC, W3CMW, W3CNP, W3DYL, W3ETA, W3FLY, W3BGD. ⁸ W7GDB, W7FRS, W7FHF, W7FXF, W7GJC. ⁹ Operators not listed. ¹⁰ W9RSL, W9UXD, W9SRT, W9SNU, W9PZM.

Inverse Feedback to S. A.

(Continued from page 24)

will result in oscillation, so that it is not difficult to get the polarity right.

A new frequency run on the amplifier showed that the response now was within 1 db from about 200 cycles on up to 15,000, using 400 cycles as a reference. At the low end, however, the output showed a rise instead of the previous drop, being up about 5 db at 100 cycles. Check on the oscilloscope showed, as expected, a phase shift at the low end which indicated reduction of feedback or possibly regeneration. The former seems more probable, since there was no tendency toward oscillation, nor did the output rise above the nor-



IT'S A NEW SPORT —but **BURGESS**

had the Portable Power for it



With the Burgess 4Z2SC for its ignition and two W30BPX batteries for its super-regenerative receiver, this radio-controlled model belonging to Pat Sweeny, Chicago, and Benjamin Porter, W1FOR, is capable of making controlled flights within a radius of eighteen miles. Thousands of other gas model airplane builders are using Burgess 4Z2SC bat-

teries for ignition in their tiny planes.

These tiny batteries, like all other Burgess products, maintain the Burgess tradition of dependable, economical portable power. They weigh less—they're built for the application—they last much longer.

Whatever the problem, Burgess provides dependable service at lowest cost.

BURGESS BATTERY COMPANY
FREEPORT ILLINOIS



BURGESS



Say You Saw It in *QST* — It Identifies You and Helps *QST*

JOB for HAMS



Wm. (Sailor) Davis, Midland
Student now employed by TWA

W4C N B
W9Y C T
W9H O N
W9D F Y
W9I Q I
W9O Q C
W9P G N
W9U L M
W7D I J

This is a partial list of call letters of farsighted amateurs who have joined their experience with Midland's specialized Airline Radio Operating Training and whom we have placed with major airlines operating in the United States.

The job of being an Airline Radio Operator is interesting, steady and profitable. Then, too, it opens unlimited future opportunities in engineering, research, dispatching, traffic, and other departments of every well organized airline.

To qualify for such a job, you must hold a second class radio-telegraph license with at least a second class phone endorsement; you must have a complete knowledge of procedure, forms, aids to air navigation, weather, symbols, official ATA code and other pertinent subjects. You must be a high speed, accurate "CW" and phone man, capable of copying both on the "mill." These are some of the requirements... MIDLAND TRAINING COVERS EVERY REQUIREMENT THOROUGHLY AND COMPLETELY.

Midland's present employment record closely approaches 100%. Frequently our students have been reserved in advance. All indications point to a substantial continued growth of the airlines and an increased demand for properly qualified radio operators. AND OUR TRAINING STANDARDS WILL BE MAINTAINED AT SUCH A HIGH LEVEL THAT OUR STUDENTS WILL ALWAYS BE IN DEMAND.

If you are between the ages of 18 and 30, have a high school education, are free of uncorrectable physical defects and have a sincere desire to enter the profession of Airline Radio Operating, write or wire for complete information immediately. Address your inquiry to

NORM G. SOUTHER

AVIATION DIVISION
MIDLAND TELEVISION, INC.

Dept. 130-M, Power & Light Bldg., Kansas City, Mo.

Affiliated with
Columbia network basic broadcasting station KMBC

mal value without inverse feedback. In either case the cure would be to load one of the interstage transformers with resistance. The loading resistor is R_{13} , whose value was determined experimentally to make the response at 100 cycles the same as at 400. If a rising characteristic is wanted at the low end, the resistor may be omitted.

When R_{13} was added, the frequency characteristic of the complete amplifier was as shown in Fig 2. From 70 to 15,000 cycles, the output is within 1 db of the 400-cycle reference value; for comparison, the original characteristic without feedback is plotted in dotted lines. The slight dip at about 10,000 cycles is probably a result of phase shift in the transformers in that region; it is accompanied by slight distortion of the waveform which, however, is quite unapparent to the ear because the frequency is so high.

So far as practical operation is concerned, the most marked difference is in improved low-frequency response. Better high-frequency response aids considerably in improving the naturalness of speech, but the benefits are largely lost because receiver selectivity cuts off most of the highs even though they may be present in the transmitted signal. On music, of course, the difference between the two characteristics is a great deal more noticeable, so that the solid characteristic is unquestionably to be preferred. The difference is plain, for instance, when the amplifier is used for phonograph record reproduction.

The penalty for improved frequency response with inverse feedback is reduction in gain. This means that more input voltage must be applied to the 6J7 grid for the same power output from the 2A3's. No accurate figure is available on the gain reduction under the amplifier conditions originally existing, because on completion of the work of installing negative feedback the 2A3's were shifted from self-bias to fixed-bias to increase the power output. With this change, the amplifier gain is down about 8 db at the 10-watt output figure. For 15 watts output (obtainable without distortion with fixed bias) the input voltage required is about three times that originally needed for 10 watts with self-bias. There is still more than enough gain for a crystal microphone, since the original sensitivity was considerably in excess of normal requirements.

GETTING MORE POWER OUTPUT

Although 10 watts from the driver is sufficient to excite a great many Class-B combinations, the additional 5 watts which self-bias operation will give is often desirable, especially when the Class-B tubes' grid requirements are near the 10-watt figure. Excess driver power is helpful in improving grid regulation and thus reducing distortion. In this case a slight rearrangement of the power supply and the addition of an inexpensive rectifier-filter bias-supply system were all that was necessary. The power transformer specified originally is provided with a secondary tap for bias purposes so that no special transformer or circuit is necessary. The revised power-supply diagram is given in Fig. 3. The bias-supply circuit consists of the 1-V rectifier, filter L_2C_2 , and volt-

HIGHER EFFICIENCY

LOWER DRIVE REQUIREMENTS

PLUS POWER

CHRISTMAS—We, of Raytheon, extend holiday greetings and best wishes for 1938.

Suggest to the family that the gift of a Raytheon Amateur Tube would be in order and would guarantee you a Merry Christmas and a Happy New Year.

You will find in your Raytheon distributor's stock the type you want:

Triodes—Pentodes—"Beam Power" Tubes.
Raytheon Amateur Tubes have been designed and manufactured with your requirements in mind.

**SEE YOUR
DISTRIBUTOR
FOR THE LATEST
RAYTHEON
DEVELOPMENTS**

RAYTHEON

TRADE-MARK

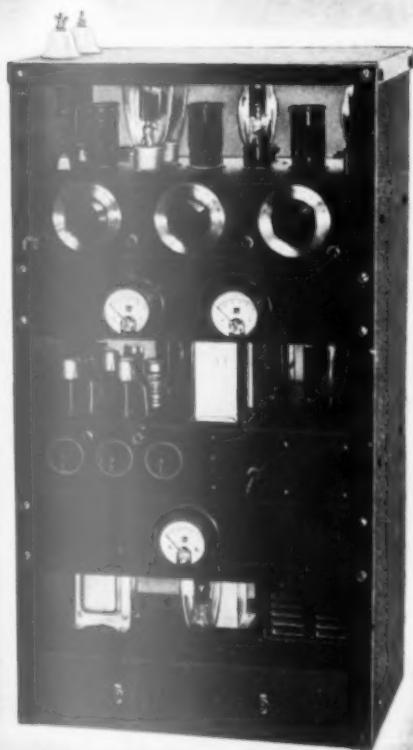
PRODUCTION CORPORATION

420 LEXINGTON AVE., NEW YORK, N. Y. • 55 CHAPEL ST.,
NEWTON, MASS. • 445 LAKE SHORE DRIVE, CHICAGO, ILL.

555 HOWARD STREET, SAN FRANCISCO, CAL.
415 PEACHTREE STREET, N. E., ATLANTA, GA.

Say You Saw It in *QST* — It Identifies You and Helps *QST*

Most Users of the Gross CB-55 Are WAC on 10 or 20



The CB-55 RADIOTELEPHONE and telegraph transmitter offers the user one of the finest units of its kind at an unheard of price, employing the latest circuits and beautiful workmanship. The use of the new T-20's in the output stage assures the user the possession of a commercial looking installation of a real power output and broadcast station quality.

The CB-55 will give fine results on the 1.7 MC, 3.5 MC, 7 MC, 14 MC, and 30 MC bands. Inputs of 95 watts can be used for phone operation. Many amateurs buy the CB-55 particularly for 10 and 20 meter operation.

The CW-55 RF unit, P-55B Power supply, L-40M Modulator unit, FB-55 Rack Frame, 3 high grade surface type milliammeters, meter cords and plugs, power connecting cables and plugs comprise the CB-55 unit.

Size: Overall dimensions, height 32", width 10", length 17".

Write for Bulletin and amazingly low price

GROSS RADIO, INC.

51 Vesey Street, New York

Cable Address: GROSSINC NEWYORK

age-divider R_6 . To reduce the plate voltage to the rated figure for the 2A3's (in the self-bias arrangement there was a drop of about 60 volts in the cathode resistor) the plate supply filter is changed from condenser- to choke-input and the transformer secondary taps changed from 360 to 425 volts. Under load conditions, the supply voltage to the 2A3's is 320 volts, allowing for a slight drop in the output transformer windings.

R_6 is a slider-type resistor, the slider being set to give the proper operating grid bias. This may be done with the aid of a high-resistance voltmeter or—and this probably is the preferable method—by adjusting the slider so that the plate current to the 2A3's is 80 milliamperes under no-signal conditions. The positive lead can be temporarily disconnected from the output-transformer primary center-tap and the meter inserted to get the reading.

In connecting the bias-supply filter condenser, make sure that the positive terminals are grounded and the negatives connected to the choke. This is the reverse of the normal procedure, and it may be necessary to make a conscious effort to overcome habit!

The extra bias lead requires the use of an 8-wire cable instead of the original seven, so that it becomes necessary to substitute 8-prong sockets and plugs in place of those originally specified for the supply connections between the two units.

The lower plate voltage under the revised circuit conditions reduces the voltage available to the low-level tubes through the voltage regulator. As indicated on the diagrams, the regulated voltage is approximately 200 volts. This is adequate for all stages, including the push-pull stage driving the 2A3's. The rated 15 watts output can be developed without perceptible waveform distortion.

There is plenty of room in the power-supply chassis for mounting the extra parts. The most convenient arrangement is to mount the 1-V socket on the chassis in the position formerly occupied by the voltage control, R_3 , moving the latter to the edge of the chassis where it can be reached without removing the cover. The choke and condenser for the bias-supply filter can be mounted on a convenient inside edge.

Although the conditions existing in the amplifier with feedback do not approach the ideal—for example, with resistance coupling throughout the phase shift could probably be eliminated within the useful audio range—it does seem to us that the improvements resulting from the changes described above indicate that equal benefits could be secured in other types of speech equipment through a few simple modifications. Provided the amplifier reserve gain in the first place is high enough to take care of the reduction brought about by the use of inverse feedback, it should always be possible to improve the frequency characteristic and to reduce distortion. Most of us find such possibilities interesting, and certainly worth a trial when little besides time needs be expended.

The New 1938 Edition of the RADIO AMATEUR'S HANDBOOK

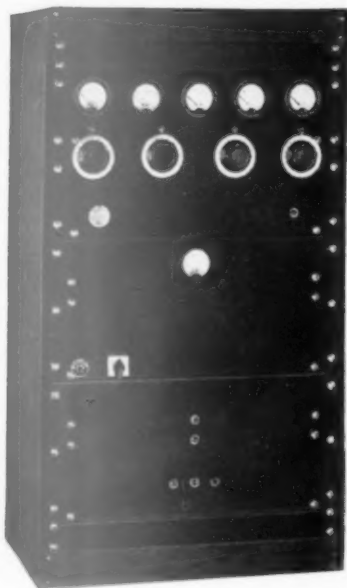
TWELVE men, each a specialist in some phase of amateur radio, collaborated four months in the production of the 1938 edition of **THE RADIO AMATEUR'S HANDBOOK**. Virtually thousands of hours of effort have been expended in a thorough-going re-writing of the book. Larger than ever before and still more profusely illustrated, the **HANDBOOK** is without question the most comprehensive ever produced. Further, the selection of the material and its arrangement have resulted in the most understandable presentation. ● Two entirely new chapters have been added — the first a thorough treatment of workshop practice covering the problems faced in working with raw material, assembling and wiring the component parts of station equipment. It includes designs for work benches and operating tables. The second new chapter is devoted to the ever-important field of emergency and portable equipment. Designs are given for the last word in emergency gear and special attention is paid to the power supply problem. ● In response to wide demand, an entirely new chapter has been written on the general subject of fundamental principles. The new chapter is aimed at those individuals, young or old, who have absolutely no knowledge whatever of electrical and radio phenomena but who demand a painless introduction to the subject. ● The remaining chapters have all been vigorously rewritten, involving an entirely new text. Those dealing with apparatus construction have benefitted from a three-months' laboratory program devoted to the design and construction of modern transmitters, receivers and power supplies, incorporating modern tried and proven circuits. In all these circuits and in the equipment built around them, a special attempt has been made to avoid anything freaky or unusual. Indeed, the work has been greatly that of selecting from the maze of good, bad and indifferent circuits only those which comply strictly with modern practice. In contrast to previous editions of the Handbook, many of the apparatus designs were prepared especially for the book and are exclusive to it.

\$1 postpaid in Continental U.S.A.—\$1.25 postpaid elsewhere
American Radio Relay League • West Hartford, Conn.

Economical!

STANCOR "100"

TRANSMITTER



A very versatile phone transmitter, using the following tubes:

6L6—T20—T55

Modulator using:

6C6—76—PP76a—PP6A3a—PPT220a

This and 15 other transmitters were built and tested in our laboratories for our new Hamanual.

If you haven't already sent for it—do so today. It's new—It's complete—It's different. It sets a new high for rack and panel type of construction.

STANDARD TRANSFORMER CORPORATION

850 BLACKHAWK STREET • CHICAGO, ILL.

STANCOR:

Please send me, free and postpaid, my copy of the new Stancor Hamanual.

Name

Address

City State

My jobber is

A Rotary Spider-Web Loop Antenna with Reflector

(Continued from page 26)

sembled. All the poles are laid out on the ground as shown in Fig. 1 so that their included angles are 45 degrees and lengths O-B, O-C, and O-D are made 6 feet. Then lengths O-B', O-C', and O-D' are trimmed to 12 feet (at the small ends of the poles, since these portions are rather weak). They are then lashed together at point "O" with the large ends of the poles at points A, B, C, D and A'.

Ordinary antenna insulators are used at "X" and "Y." Two insulators at point "Y" can be used to better advantage than a single insulator since this will provide a means for drawing up the radiator to make it taut after it is of the correct electrical length. At all points other than "X" and "Y" (a total of eleven) where either the radiator or reflector is secured to a point on any bamboo pole, the above-mentioned porcelain cleats or other insulators are used.

The distance from insulator "X" to point "G," at the center of reflector, is approximately one-quarter wave. The reflector is cut long and pruned for greatest current in the reflector at point "G" with the radiator excited. A small incandescent bulb (Xmas tree type) shunted across a few inches of the reflector at point "G" is a simple means for indication of maximum current at this point. Should you have a radio-frequency meter around the shack with appropriate scale, it can be used to advantage. The reflector length was found to be quite critical.

The spacing of the reflector and radiator should be set with a signal-strength meter if possible. Testing with a distant station is also all right, provided the receiving station has a meter of some kind for indication of signal input and the band is in a steady condition at the time of the tests. This latter, however, is practically impossible to attain. In tuning up be careful to make sure that the antenna is always at the same height because the effective height above the ground influences radiator and reflector lengths. In one instance here we found that the radiator had to be lengthened 7 inches when 4 feet off the ground whereas at 24-foot height it had to be this amount shorter. Remember that care in pruning is the difference between an antenna that goes places and one that is just another antenna.

As mentioned previously, the array can be suspended between two masts or poles by making a simple bridle of rope (similar to a kite bridle) attached to points 1, 2, 3, 4, 5, 6, 7, 8, and 0. We tried attaching the bridle to points 1, 2, 3, 4 and 0, but prefer the former because it prevents sag. Shortening up on the forward ropes permits adjustment of the tilt angle. A separate rope could be run to the operating room to adjust the tilt angle if preferred. This could be accomplished by running a rope through a small pulley which is secured to a stick driven in the ground directly beneath the antenna pole intersection. We have

The Entire Newark Organization Sincerely Wishes You a Very



Merry Christmas



DO YOUR 1938 SHOPPING EARLY . . . AND SAVE MONEY

Everything You Need
For Winter "DXing!"
No "Back-Orders!"
4-Hour Service!

TIME PAYMENTS

Easy terms on orders for parts, sets and tubes, \$60.00 or more. We have all the new amateur sets as soon as released by manufacturers, on our convenient 6% Credit Plan. No matter what set you want, we can furnish it. All the standard makes in stock for immediate delivery. Before you buy, WRITE US. You'll SAVE MONEY!

All Standard Sets
and Parts Available
on Time Payments.
Buy Now . Pay Later!

ONLY A FEW OF THESE LEFT VERY SPECIAL

Oil Filled
and Oil Impregnated

FILTER CONDENSERS



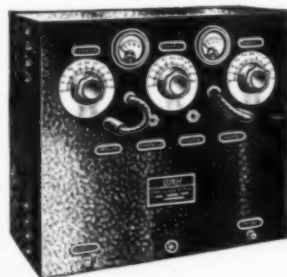
Lucky purchase of 10,000 all well known makes enables us to offer astonishing low prices. All Guaranteed at rated voltages. Already sold down to limited supply and going fast.

Order Now

2 mfd., 2000 V. DC, 4 7/8 x 3 1/4 x 1 1/2, 1 1/4 lbs.	\$1.50
3 mfd., 1250 V. DC, 3 1/4 x 3 1/4 x 1 1/2, 1 1/4 lbs.	1.25
8 mfd., 2000 V. DC, 5 x 3 1/4 x 3 1/2, 2 3/4 lbs.	2.75
9 mfd., 3000 V. DC, 5 1/4 x 3 1/2 x 1 1/2, 9 lbs.	7.25
(Including 2 1/2" Bakelite Standoffs)	
4.4 mfd., 1500 V. DC, 5 x 3 1/4 x 1 1/2, 1 1/4 lbs.	1.75

CORRECTION!

An error was made in the Listing of the Prices on the Utah Amateur Transmitter Kits ON PAGE 37 OF THE NEW NEWARK HAM CATALOG. The correct prices of the Kits are given below. Please change the prices in your catalog accordingly.



UTAH JR.	\$15.95
UTAH KIT NO. 1	\$49.75
UTAH KIT NO. 2	\$44.50
UTAH KIT NO. 3	\$13.95
UTAH KIT NO. 4	\$49.75
UTAH KIT NO. 5	\$49.75

Newark is "headquarters" for Utah Xmitter Kits and Ham Transformers in Chicago. Investigate our easy payment plan.

FREE

1938 Newark Catalog! Just off the Press. Hundreds of New Items! Bigger Values! Lower Prices! Write for your copy NOW!

Buy Your Receiver NOW . . . Pay Later!

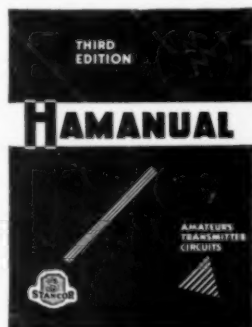
Newark offers you a complete selection of all of the newest amateur receivers . . . always in stock, ready for immediate delivery. Note the following Easy Payment Plan . . . buy now . . . pay later. We ship 10 days after receiving down payment.

	Cash Price	Down Payment	6 Months Payments	9 Months Payments	12 Months Payments
National NC-101X complete with tubes, crystal and speaker.	\$129.00	\$24.00	\$18.58	\$12.50	\$9.47
National NC-100X complete with tubes, crystal and speaker in cabinet.	\$147.60	\$27.60	\$21.00	\$14.21	\$10.80
National NC-100 complete with tubes and speaker in cabinet.	\$125.10	\$20.10	\$18.58	\$12.50	\$9.47
National HRO with tubes and coils.	\$179.70	\$29.70	\$26.14	\$17.67	\$13.45
National HRO with tubes, coils and power supply.	\$195.60	\$35.60	\$27.84	\$18.83	\$14.33
National NC-80X complete with tubes, crystal and speaker chassis.	\$88.00	\$18.00	\$12.68	\$8.53	\$6.44
Hammarlund Super Pro complete with tubes, crystal and 8" speaker.	\$261.00	\$41.00	\$38.08	\$25.78	\$19.64
ACR-155 complete with tubes and built in speaker.	\$74.50	\$14.50	\$11.00	\$7.39	
ACR-111 complete.	\$189.50	\$39.50	\$26.14	\$17.67	\$13.45
RME-69 complete with tubes, crystal and speaker in cabinet.	\$151.20	\$26.20	\$21.94	\$14.77	\$11.25

FREE "HAMANUAL"! Nothing Like It Ever Before Compiled!

Brand New! Different! Better! Never before has such valuable Transmitter data been offered you, free. Shows you how to put new life in your old rig. Contains complete data on how to build 16 NEW TRANSMITTERS! Gives complete schematic blueprints of new circuits, from 5 watts to 1 kw. Gives complete lists of all parts necessary. Lists the new Stancor Transformers for all the new tubes. Page after page of valuable ham data. You need this book . . . it's FREE. Send for your copy Now!

Newark carries all the parts in stock for the New Transmitters described in the above Stancor Hamanual. No need to split your orders. Buy from Newark and save time, trouble and money.



NEWARK ELECTRIC COMPANY

226 W. MADISON ST. Dept. Q CHICAGO, ILL.

ANNOUNCING LEEDS

Appointment as **SOLE DISTRIBUTOR** in
Greater New York for the

KENYON TRANSFORMER CO.

We have, for years, sold to the amateur only those products which rigid tests have proven dependable. We believe that the addition of **Kenyon Amateur and Public Address Components** to our ever growing list of quality merchandise, will be welcomed by our many friends throughout the world.

We Have In Stock For Immediate Delivery

The complete "T" line as well as the "K" and "R" lines. A catalog showing these will be mailed at your request.

KENYON HAM SPECIALS



D-100, 20 H. 200 MA. \$1.50 5/25 H. 200 MA. D-101
D-102, 20 H. 300 MA. 2.90 5/25 H. 300 MA. D-103
D-104, 20 H. 400 MA. 3.50 5/25 H. 400 MA. D-105
D-106, 20 H. 500 MA. 5.00 5/25 H. 500 MA. D-107

POWER TRANSFORMERS

Completely shielded — High voltage

D-200, 750-1000 v. each side C.T. 300 MA. D.C. \$5.25
D-201, 1000-1250-1500 v. each side C.T. 300 MA. D.C. 6.80
D-202, 1500-2000-2500 v. each side C.T. 300 MA. D.C. 11.00
D-203, 1000-1250-1500 v. each side C.T. 500 MA. D.C. 11.00

Don't forget that LEEDS LD-5 Crystals are cut to your exact specified frequency in the 40- 80- and 160-meter band at **NO EXTRA CHARGE**. Mounted in metal holder to fit standard 5 prong socket and unconditionally guaranteed. Net. **\$3.50**

The New GENERAL RADIO OCTAL SOCKET

can be mounted above board or sub-base. Each contact separated by a thick bakelite wall. By far the finest octal socket.

Type 688, each net 40c; 10 for \$2.75

General Radio Coil Forms

Notched to provide permanent winding space for wire up to No. 10 B & S; forms 4 3/4" long.

Type 677-U, 2 3/4" diameter. 50c

Type 677-Y, 3 3/4" diameter. 75c

We carry a complete stock of

RAYTHEON Transmitting Tubes

TAYLOR Transmitting Tubes

RCA Transmitting Tubes

CARDWELL Condensers

HAMMARLUND Condensers

NATIONAL Condensers

Our technical department welcomes your inquiry



LEADS THE FIELD

World Wide Service to Amateurs

45 Vesey Street
New York City

Tel. COlandt 7-2612

Cable Address: "RADLEEDS"

not attempted this, but believe it could be made to work.

A word about the tilt angle. A fixed tilt angle of 15 to 20 degrees, determined experimentally here at this location, seems to be about right. On tests with stations in this country we found that a tilt angle of approximately 20 degrees increased the signal strength nearly 33 percent as compared to either a tilt angle of 0 degrees or 45 degrees. As the tilt angle approached 45 degrees the gain equaled that which was obtained in the horizontal position. The radiation to the rear decreased at a 20-degree tilt angle and increased to half the forward radiation at both 0 and 45 degrees. This made for a front-to-back gain in the array of approximately 8 db at the distant receiving station.

In Fig. 2 a field-strength diagram is given for the array. This was taken by setting up a field strength meter 300 feet distant from the antenna and then rotating the array. The curve is plotted for db values above the minimum observed. The pattern is unbelievably sharp for such a simple array. Often, after hearing some station, we rotate the beam until we get maximum signal

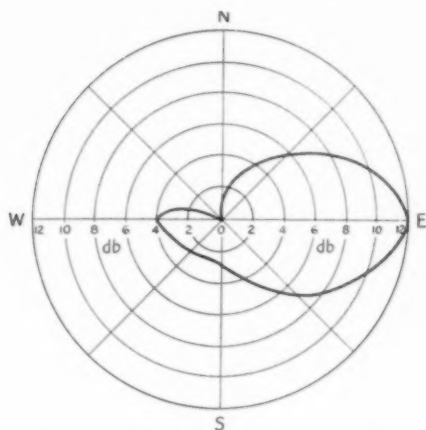


FIG. 2—RADIATION PATTERN PLOTTED IN DB ABOVE MINIMUM FIELD STRENGTH IN N.W. DIRECTION

The measurements were made with the web 24 feet above ground and tilted 20 degrees above horizontal in the forward direction.

strength on the receiver. You really get a kick hearing a weak DX signal build up until it is above the noise. Also, it is amusing how it discriminates against signals that would otherwise make a QSO impossible.

In addition to having a lobe right off the front there are also lobes off the top and bottom. Working at a height of one-half wavelength above ground seems to assist in cancelling these two lobes. However, they are not entirely lost and they undoubtedly help from a high-angle radiation standpoint. It seems to work out in practice that during the daylight hours when skip is comparatively close in, possibly only 1 to 2 S-points difference in signal strength may be noted with rotation of the array. However, at other times, when the skip distance is much greater, a differ-

Square Cases By...

Sensitive and Ultra-Sensitive Indicating Instruments. D.C., Moving Coil A.C. the Repulsion Type.

Specify Triplett for the finest, most up-to-date instruments in appearance, performance and economy.



Model 426

TRIPLET

**EVERY
STYLE
FOR EVERY
NEED**

Available With
Front or Rear
Illumination



Model 421



Model 326-A



Model 326



Model 327



Model 227

Triplett instruments are noted for —

Highest Quality

1. Bar Bridge Construction.

2. Magnet Pole Pieces Are Continuous — Gauged to Precision Accuracy.

3. Fewer Magnetic Parts . . . Greater Initial and Lasting Accuracy.

4. Fully Aged to Relieve Strains and Unnecessary Adjustments.

5. Unsurpassed for Ruggedness and Wearing Qualities.

Low Cost

1. Recognized in Industry for Greatest Value in Instruments.

2. Produced on Quantity Production Basis.

3. Manufactured by Highly Skilled Workers.

Other standard types available include Round Cases — 2", 3" and 5" sizes; Fan Type Cases — 4" x 4 7/8" overall case size; Twin Case (2 instruments in one case) 3 5/8" x 5 1/2"; Portables — 3" and 5" sizes.

If you have an electrical instrument problem, write to TRIPLETT

THE TRIPPLETT ELECTRICAL INSTRUMENT COMPANY

2512 Harmon Avenue, Bluffton, Ohio

☐ Please send me more information on Triplett Models I am also interested in

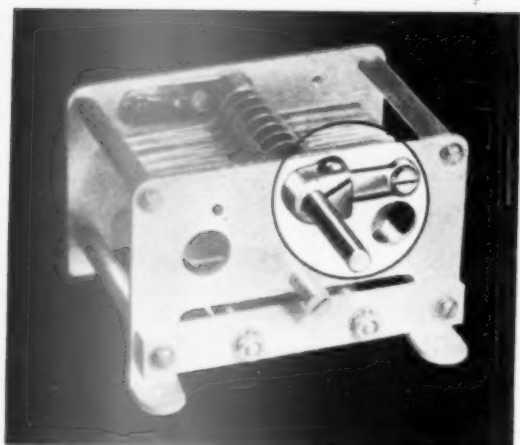
Name

Address

City State



Say You Saw It in QST — It Identifies You and Helps QST



ROTOR LOCK

This simple device clamps the rotor rigidly, making adjustments proof to vibration and unauthorized tampering. It will fit any National condenser having a 1/4" shaft, and may be fitted to many condensers of other manufacture. Net Price \$.51

NATIONAL COMPANY, INC.
MALDEN, MASS.

HOLD IT

in the Palm of Your Hand



It's the new Shure "Military-Type" Hand Microphone — and it's just made for you! Fits naturally, firmly in the palm of your hand. Small, light, compact — rugged and dependable. Remarkably convenient to use. No bothersome handle. Slips easily into pocket when not in use. Takes up minimum space in portable equipment. Optional locking press-to-talk switch.



Ask your Jobber or Write for Bulletin 144Q.

Shure Patents Pending. Licensed under patents of the Brush Development Company.

General-Purpose Carbon and Crystal Models. List Prices, complete with cable and suspension hooks \$15 to \$31.50
Also available in "Anti-Noise" Close-Talking Models.



ence of as high as 6 S-points have been noted after rotating the array.

W8MJM has had one up for approximately five months and claims much for it, especially from the receiving angle. W9CIH, Bob Palmer at Ashland, Wis., has also had one up for quite some time. He has been reported "S9 plus" in Manila, P. I., at noon, C.S.T., and says that to date he never has had less than S7 from VK's. The snapshot of W8MJM's installation shows it to be more of the conventional type of rotary set up. Bob has his on top of the house.

In conclusion, we can state that the rotary web array has far surpassed the general run of fixed type antennas used at this location. It has been in operation since March 20, 1937, and has given excellent service since its installation. QRM is decreased to a remarkable extent when using the array for a receiving antenna; and the system also has been a revelation in hearing and working DX.

. . . 78° North, 72° West

(Continued from page 31)

signals have been heard on the 3.5- or 8-Mc. bands. On 28 Mc., during the first part of October, I did hear a few weak signals. However, not much time was spent there; merely listening just to see what conditions were like. I hope we shall be able to contact all of you boys who want to get another country or zone that lies up here for you. Your messages, relays and contacts are all greatly appreciated by Captain C. J. MacGregor, by the crew and me. We will be frozen in here at Reindeer Point, near Etah, Greenland at least until the middle of next July—then we leave as soon as the ice breaks up and we can get out.

The MacGregor Expedition Transmitter

THE r.f. line-up consists of an RK-25 crystal oscillator capacity coupled to an RK-39 buffer-doubler. This stage is link-coupled to a pair of RK-20's which furnish ample power to drive the final, consisting of two HK-354's running at 2000 volts with an input of 500 watts. When this lay-out was decided upon it was borne in mind that it would be possible to use the RK-20's as the final should reduced-power operation become desirable.

To guard against burning out irreplaceable parts, an underload and an overload relay were incorporated in the power supply of the final.

The audio-frequency end of the transmitter was built to operate from a crystal microphone. The speech equipment is divided into two sections, a pre-amplifier and main amplifier, so designed that the frequency response characteristic and hum level are satisfactory for re-broadcast use. The pre-amplifier is resistance coupled up to the output, and is very compact. Two gain controls are provided to take care of the different levels of the microphones used. The volume con-

Give yourself a gift this year!

A fine RCA Communications Receiver will bring you years of peak performance! And the prices are surprisingly low!

Take advantage of current prices and give yourself a Christmas gift! A gift of outstanding amateur radio pleasure for years to come—an RCA Communications Receiver!

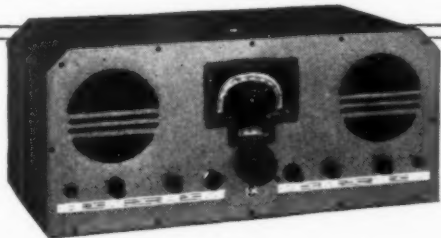
Built on the solid foundation of unequalled RCA experience in every phase of radio, RCA amateur equipment offers you top performance. Providing advanced features, manufactured with the finest materials, and available at very moderate cost, either of the receivers below is a value you cannot afford to overlook! See your nearest supplier, or write to address below for details. No obligation.

RCA presents the "Magic Key" every Sunday, 2 to 3 p. m., E. S. T., on NBC Blue Network

**FOR THE FINEST IN RADIO, BUY
"RCA ALL THE WAY!"**



For radiotubes it pays to go
"RCA ALL THE WAY."
First in Metal—Foremost in Glass—Finest in workmanship.



ACR-155—A moderately priced 9-tube communications receiver covering from 520 to 22,000 kilocycles. Peak performance is assured by such RCA features as magnetite core i-f transformers and plunger-type air-dielectric trimmers. Price **\$74.50***

**Amateur's net prices f. o. b. factory*



ACR-111—Including every worthwhile feature for communication service, this new receiver represents the last word in modern design. Of particular importance are the constant-percentage electrical bandspread system, noise suppressor, two r-f and i-f stages, exceptional sensitivity and signal-to-noise ratio. Complete at **\$189.50***



for Amateur Radio

AMATEUR RADIO SECTION

RCA MANUFACTURING CO., INC., Camden, N. J. • A Service of the Radio Corporation of America

Say You Saw It in QST — It Identifies You and Helps QST

Type HFM Portable Crystal Control

7000 — 60,000 Kc.

PHONE — CW — MCW



- Single 40 Meter Crystal for All Bands
- A.C. or Battery Operation
- Complete With Coils for 5-10-20 and 40 Meters

H-F-M
TRANSMITTER

\$57.60

5 METER DUPLEX TRANSMITTER-RECEIVER

- T.R.F. and Super-Regeneration
- 7 Tubes — 5" Dyn. Speaker
- 6E6 Unity Coupled
- 10 watt Carrier
- 100% Modulation
- Duplex Operation — PHONE ● MCW

TRANSMITTER —
RECEIVER

\$47.70



FREE —

with every purchase. An accurate 8-inch white wood

SLIDE RULE

with A, B, C, D, C1 and K Scales, instructions and durable cardboard carrying case. Or post paid in U. S. and Canada for 40c each, no stamps. One rule to a customer.

RADIO TRANSCIVER LABORATORIES

8627 — 115 Street, Richmond Hill, New York

You Can Be a Good Fast Sender with a Genuine

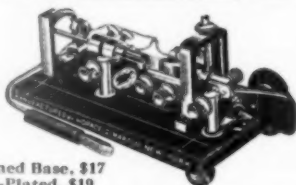
VIBROPLEX

Press
Lever—
Vibroplex
Does the Rest

**JUNIOR
ONLY**

\$12.50

Smaller and more compact but in every other detail the same as large model. Large points. Japanned Base. Complete with wedge and cord.



Japanned Base, \$17
Nickel-Plated, \$19

Vibroplex speed, clarity and sending ease develops a degree of sending proficiency seldom attained by users of the old type key. Over 100,000 operators use the Vibroplex because they have found it the clearest, speediest and easiest way to send. Actually cuts sending

effort in half. There's a real thrill in store for you, when you send with this smooth, effortless bug. Costs no more than imitations. So why not get the best. Only the Genuine Vibroplex has "THE BUG" trade mark. Look for it. Your old Vibroplex accepted as part payment. Money order or registered mail. Write for **FREE** catalog.



THE VIBROPLEX CO., Inc.

832 Broadway

New York, N. Y.

96

Say You Saw It in QST — It Identifies You and Helps QST

trol in the grid of the last pre-amplifier stage is always kept at the lowest setting possible without making it necessary to overload the first two stages. This, together with the fact that the low-level stages are run at greatly reduced plate voltages, makes it possible to have a large amount of gain in reserve without the attendant microphonic and noise problems. In order further to reduce microphonics the chassis is mounted on four conical springs which absorb and deaden shocks. The pre-amplifier sits on the operating table beside the microphone, convenient for gain adjustments and well separated from its power supply, which is in the rack. The output is coupled to the main amplifier from the 500-ohm output through a shielded cable.

In the construction of the entire transmitter "trick" circuits were avoided; only the tried and proven ones were used. This was not necessarily dictated by a conservative nature but by time. The ship was due to sail within such a short time after all the parts were at hand that the bugs to be ironed out had to be practically non-existent. Two racks full of parts had to go together and work right, the first time. They did. In fact there was enough time left over to get a few hours' sleep before loading the transmitter on ship board.

Following this conservative design the driver for the modulator consists of push-pull 6C5G's transformer coupled to push-pull 2A3's self-biased. The 2A3's drive a pair of United Electronics 905's operating at zero bias and 1250 volts plate. The 2A3's provide ample driving power with good regulation so 250 or more watts of audio are available. The 905's are capable of delivering 300 watts under the operating conditions, so no more than the usual trouble of adding a stabilizing resistor or condenser in the various grid circuits was anticipated. Upon final test, however, it was evident that the full power output with beautiful quality was being obtained. No further adjustment was needed.

The power supplies are designed to operate well within the maximum tube ratings in order to obtain trouble-free operation. Time-delay relays protect all mercury-vapor rectifiers from the application of plate voltage before the filaments are up to temperature, and more than adequate wiring insulation throughout insures against breakdowns.

To keep hum level down sufficiently to be acceptable for rebroadcast purposes, ample filtering is used on all power supplies. Careful checks at the time of construction indicated a hum level 55 db below maximum signal.

For several reasons it seemed best to construct the rack assembly so that all the input and output connections on each chassis would be readily accessible from the rear. In the first place, the racks had to be completely taken down to get them in or out of the cabin of the ship. Secondly, it would be easier to locate and isolate any fault. Following this plan each chassis was provided with screw terminals for its a.c., d.c., audio or r.f. inputs or r.f. inputs and outputs, stand-off insulators being used when necessary. The final

FLASH!

SUPREME CRASHES THROUGH

WITH THE
**SMALLEST OSCILLOSCOPE
EVER DESIGNED**

FOR THE
2-INCH CATHODE RAY TUBE!

PRICED AMAZINGLY LOW AT ONLY
\$4.00 DOWN—\$4.00 MONTHLY
ON S. I. C. PAYMENT PLAN

\$21⁹⁵



*Model 531
Cathode Ray Oscilloscope*

Always a step ahead of the rest—Supreme now offers the smallest, handiest oscilloscope with a 2-inch cathode ray tube having four times as much fluorescent area as the 1-inch cathode ray tube! In the "ham" laboratory, its compact size requires but little room, measuring only $5\frac{3}{8} \times 7\frac{3}{4} \times 9\frac{1}{2}$ " overall—and its weight of only 8 lbs. makes the instrument highly portable!

Radio amateurs will find Model 531 extremely valuable for visually checking modulation percentage and other characteristics of their rigs.

P. A. technicians will find it useful for checking distortion and other characteristics in amplifier stages.

Service engineers and technicians will find it useful for checking transformer defects, the analysis of phase and frequency modulation in Lissajou's figures, and in many other applications.

In any circuit in which an A. C. meter can be used, the Model 531 gives you the *plus* advantages of greater sensitivity, the study of the amplitudes with relation to the time element, and the fact that the oscilloscope cannot be damaged by overload potentials which usually damage A. C. meters or the rectifiers associated with such meters. It's a handy, efficient instrument you can't be without! Write for complete details—or see your jobber!

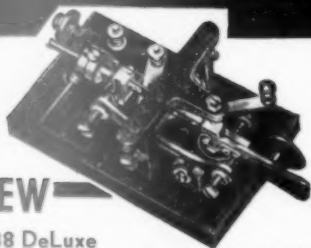
SUPREME INSTRUMENTS CORP.

Greenwood, Miss., U. S. A.

Export Dept. Associated Exporters Co., 145 W. 45th St. New York City • Cable Address: Lupreh, New York

Say You Saw It in QST — It Identifies You and Helps QST

NOW! the World's Champion Telegrapher Offers You His Radio Key



NEW

1938 DeLuxe MAC KEY for SPEEDY, TIRELESS RHYTHMIC SENDING

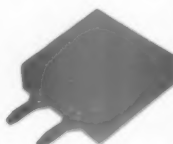
- New dot stabilizer, selected main-spring. Heavy Marbleite base "stays put." Big silver contacts, large adjustment screws. In every detail the finest ever produced. Worth many times the low net price of \$9.50.
- Standard model MAC KEY. Essentially the same as the DeLuxe, only \$7.50.
- MAC STRAIGHT KEY — acclaimed by the experts. Excellent balance. Heavy base. Priced so every operator can have one. Only \$1.50 net.
- MAC OSCILLATOR — 1000, 800 or 600 cycle notes with tone control. Amazing value, only \$4.50 net.
- MAC PRACTICE SET — a practical instrument of commercial caliber. Employs MAC STRAIGHT KEY and MAC HUMMER. Just \$2.95 complete.
- MAC HUMMER, \$1.50.
- MAC AUTO, \$69.

See your jobber or write for details.

T. R. McELROY

175 Congress Street, Boston, Mass.
WORLD'S CHAMPION TELEGRAPHER

PRECISION CRYSTALS



Crystal Holder

Highest quality crystals, one inch square, carefully ground for frequency stability and maximum output. Be sure of your transmitter frequency — use PRECISION CRYSTALS.

Low frequency drift crystals (Type L T C) supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750 and 3500 kc. bands — \$3.50 each. 7000 kc. band \$4.00 each. Holder \$1.00.

(Holder as illustrated to fit G.R. jacks or round holder to plug into a tube socket can be furnished. G.R. jacks to plug illustrated holder into — \$1.15 pair.)

X cut PRECISION Crystals carefully ground for maximum power supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750, 3500 and 7000 kc. bands — \$3.00 each. Add \$1.00 if holder is desired.

AT cut crystals for commercial use quoted on at your request. When ordering our product you are assured of the finest obtainable. Now in our seventh year of business.

PRECISION PIEZO SERVICE

427 Asia Street

Baton Rouge, La.

cabling and installation of protective relays and switches was done on board ship. A type of varnished-cambrie covered wire which will stand a test of 12,000 volts was used for all high-voltage leads.

A message dated October 28th to A.R.R.L. Hq. was received by W1DF saying that the following stations had been worked by OX2QY-W10XAB-WAWG up to date of Oct. 28th:

W1ADM W1AQF W1AQT W1BLO W1CC
W1CRW W1DF W1EH W1IAS W1IED W1JND
W1JNH/2 W1JZA W1KCK W1LZ W1SZ W1ZB
W2AN W2AZ W2BYP W2CIF W2CQL W2CYS
W2EEN W2FZY W2GTZ W2GUM W2JIG
W2IXY W2JT W2PP W2QL W2WC W3ANH
W3BEM W3BSY W3CIM W3CZS W3DHM
W3DPU W3EMA W3EMM W3ETV W3EXB
W3FQP W3GIH W3QP W4AHH W4BAZ W4BYY
W4CYU W4DCR W4DSY W4EQM W4ERT
W4MS W4QI W4TO W5ACF W5ASG W5COU
W5CYC W5ECT W5EGQ W5FHH W5FIY W6EW
W6EXQ W7ALZ W7AMX W8AON W8AYN
W8BTI W8CJG W8CJJ W8CRA W8DFH W8DHM
W8FJN W8GYB W8HXO W8HZU W8ISK W8ITK
W8KML W8LJ W8LPI W8LRJ W8LTR W8LYQ
W8MAH W8MPX W8NHP W8NJP W8NWV
W8NXQ W8NYD W8ORQ W8POQ W8PTD
W8QDU W8QFI W8QGU W8QXT W8RL W8WI
W8ZY W9ADN W9AFB W9AKI W9BBU W9BCV
W9BEZ W9CJJ/9 W9DGL W9EBQ W9EME
W9FJK W9FKA W9FOV W9FS W9HER W9HVT
W9IAC W9IVG W9JIE W9MDF W9NER W9QI
W9SDQ W9UAZ W9VDY W9VXZ W9WZW
W9YOL W9ZDO W9ZTO C02EG C07CX H17G
LU9BZ VE2GA VE3QL VE3RN VE4BB VE4RO
VO6JQ.

Army-Amateur System Activities

(Continued from page 32)

The Ninth Corps Area won first place, the Third Corps Area second, with the Seventh Corps Area third.

W8GMZ, Third C.A., had the highest individual score of 75 points. W6CVL, Ninth C.A., was second with 56 points, and W9BNT of the Seventh C.A. and W6KFC of the Eighth C.A. tied for third place with 53 points each.

Designing the Speech Amplifier

(Continued from page 34)

is needed. The gain of the input amplifier described in this article is about 21 db. The 6J7-6J5 combination is an ideal one to drive a pair of 2A3 tubes in Class-AB. The gain is adequate for use with microphones of -60 db or higher output level.

These design considerations have worked out very well in practice. In the photograph is an amplifier which was built by the author for the Bowdoin Expedition station, VE1IN. This was originally designed with a triode instead of a pentode in the input stage. When an attempt was made to transmit bird calls to a receiver and sound truck for scientific recording purposes, we had



"Our experience with Delco-Remy police generators during the past four years has been most satisfactory and we now have nearly all of our radio cars using Delco-Remy equipment. The high charging rate of these generators at low engine speeds is most desirable for scout cars and cruisers and we have found their performance most dependable."

CAPTAIN ROBERT TURNER
Inspector of Motor Vehicles
Detroit Police Department



LIEUTENANT EDWIN C. DENSTAEDT
Supervisor of Radio
Detroit Police Department
Past President, Associated Police
Communication Officers

THE MOTOR CITY KNOWS ITS GENERATORS

The use of Delco-Remy Special Service Generators by the Police Department of Detroit—fourth city of the United States—is another outstanding example of the widespread selection of Delco-Remy generating equipment by local and state law enforcement agencies. Delco-Remy police generators are high-output generators designed and built to furnish the extra current required for police radio work. Coupled with Delco-Remy Current and Voltage Regulators, they give continuous, trouble-free operation and keep cruisers and scout cars in service the maximum amount of time. Amateurs, too, find that Delco-Remy High-Output Generators provide ample current for two-way radio service and experimental work in their own cars.

Any Branch or Electrical Service Station of United Motors Service can supply Delco-Remy High-Output Generators for special installations. Ask them to suggest a generator for your needs.

Delco-Remy

ANDERSON, INDIANA



Delco-Remy products are sold and serviced by United Motors Service Stations everywhere . . . wherever you see this sign.

World's Largest Manufacturer of Automotive Electrical Equipment

Say You Saw It in QST — It Identifies You and Helps QST

Save Money



Just compare net costs to you! You can't beat AEROVOX prices.

And remember too the quality. These units stand up.

All due to use of HYVOL—the new super-dielectric oil.

DATA...

Latest AEROVOX catalog lists several new transmitting components. Ask your jobber or write us for copy.

600 to 3000 v. D.C. working.

1 to 4 mfd. Capacity.

Welded steel can. H.T. terminals. Leakproof.



DO YOU WANT TO LEARN WIRELESS and TELEGRAPHY?



TWO BOOKS EVERY AMATEUR SHOULD HAVE—

Send Now!

10¢ Each
POSTPAID
COIN, OR
STAMPS

Hundreds of amateurs have learned from these books, so can you.

These books give you the fundamentals of wireless and telegraphy. They contain the codes and how to learn them. Mail your order now to:

SIGNAL ELECTRIC MFG. CO., Menominee, Michigan

ESTABLISHED
1892



great difficulty with r.f. pickup coming in from a 1400-foot unshielded cable connecting a field amplifier of -25 db output to the speech amplifier illustrated. We had expected, too, that this pickup could be eliminated by choice of band-stop or low pass filters inserted in the 500-ohm line. However, even such drastic methods would not stop the r.f. interference. Then the 6J7 pentode was installed in the amplifier and the trouble was cured completely. Furthermore, this almost phenomenal success has been duplicated by us with entirely different setups.

Cathode Coupled Driver for Class-B Modulators

(Continued from page 35)

preamplifier, employing, for instance, push-pull 6C5's, 56's, 76's, or their equivalent, as the final stage.

It is well to admit here and now that the drive delivered by the 6L6 to the 805's in this circuit possesses some harmonic content at high power levels, but this is so small that on voice amplification it is not noticeable to the ear, and shows up but slightly on a 'scope. This should not be misconstrued as a reflection on this economical drive system; many of the conventional plate-coupled drivers produce much more distortion.

The modulator, shown in Fig. 1, is so designed that it will work from any line having a level of +14 to +20 db, although it could be coupled directly to a low-level stage by use of an inter-stage transformer with a 3:1 step-up ratio. As previously mentioned, this type of driver is degenerative, and thus more voltage must appear from the grid of the 6L6 to ground than across the primary of the driver transformer T_2 . This means that more voltage is usually needed at the grid of the 6L6 than could be obtained from a low-level stage. The 6L6 is operated with 400 volts on the plate and 300 volts on the screen.

A variable resistor is used in the cathode of the 6L6 tube. This is for adjusting the bias on the 6L6 (-20 to -22 volts). A jack for reading the plate current of the 6L6 (50 to 55 ma.) is also included so that the tube may be adjusted for maximum swing without overloading. This condition would be indicated by a shift in the plate current of the 6L6. Furthermore, the driver transformer used is of the variable-ratio type, which allows adjustment for best results and covers a wide range of ratios. Thus the constants of the circuit in which the 6L6 operates may be varied for optimum performance.

The best ratio, as found by the author, was a step-down ratio, primary to $\frac{1}{2}$ secondary, of 1.30 to 1.0; that is, a step-up ratio, primary to total secondary, of 1:1.54—so that an r.m.s. grid voltage of 150 volts grid-to-grid at the 805's necessitates approximately 100 volts on the primary of the driver transformer, and approximately 120 volts to the grid of the 6L6—which boils down to approximately the original +14 db level input, when transformed from the 500-ohm line.

1937

Troubles



CAN BE
OVERCOME

IN

1938

With



QST

BINDERS

priced at

\$1.50

postpaid

(Not available outside of the United States and Possessions)

(One set of yearly labels (1921-1940) provided with each binder)

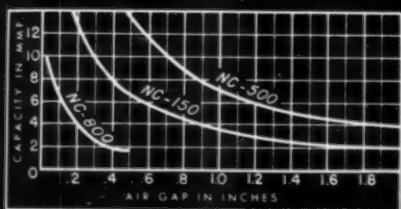
American Radio Relay League
West Hartford, Connecticut

NEUTRALIZING CONDENSERS

National pioneered the unusual design of these neutralizing condensers. Widespread use has proved the soundness of their principle and the honest quality of their construction. All sizes have both plates insulated by Isolantite, and have heavy aluminum plates machined to a smooth rounded edge.

Three sizes are offered. The smallest (Type NC-800, Net Price \$1.80) is suitable for the RCA-800, EIMAC 35T, 50T and similar tubes. The next larger size (Type NC-150, Net Price \$3.90) is for tubes like the HK-345, RK-36, 150-T, 300-T and 852. The largest size (Type NC-500, Net Price \$7.50) is suitable for the WE 251A and similar tubes.

The chart at the left shows the capacity in mmf. for various settings of the spacing between the plates.



NATIONAL COMPANY, INC.

NO HALF-WAY MEASURES CANDLER TRAINED OPERATORS *Know their Stuff!*

YOU ACQUIRE CODE SKILL plus A RADIO EDUCATION WHEN YOU'RE CANDLER TRAINED



CANDLER TRAINED
T. R. McElroy

World's Champion Radio Operator teaches Candler System at Harvard College

"Practice alone won't make a skilled operator. You need Automatic Sound Consciousness, taught exclusively by the Candler System. It's the easiest and fastest way I know to learn code or increase your speed."

Why stumble along by yourself trying to learn code the hard way? Walter Candler will develop your sending and receiving senses to work AUTOMATICALLY! You will read entire words — even sentences of code, just as easily as you read print. It's so easy when you practice right! And that's not all! Candler trains you in the Theory and Practice of Radio! You get code training PLUS a Radio Education — all at one surprisingly low price. Candler is personally interested in making every one of his students an all 'round good operator. You can soon be pounding brass with the best of them. Why wait? Mail the coupon TODAY!

MAIL COUPON TODAY FOR FREE BOOK

CANDLER SYSTEM CO.
Dept. Q-12, Asheville, N. Carolina, U.S.A.
Send me your FREE book right away! My present speed is wpm.

Name
Address
City State

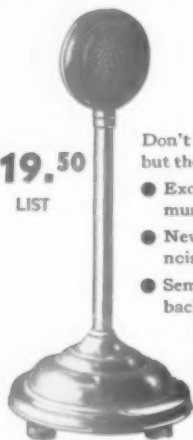
**CANDLER
SYSTEM CO.**

Dept. Q-12, Asheville, N.C., U.S.A.

NOW! A NEW QUALITY CRYSTAL MICROPHONE

MODEL
T9
(PERFECT TONE)

\$19.50
LIST



MODEL T9
With stand \$22.50

Don't be satisfied with anything but the *newest* crystal mike.

- Excellent for both voice and music. Hi-level — minus 53DB.
- New shock proof interior — noise and breakage eliminated.
- Semi-Directional — less feedback and background pickup.
- Beautiful chrome and ebony finish.
- Iron Clad guarantee.

ASK
YOUR JOBBER
NOW!

THE TURNER COMPANY
Cedar Rapids, Iowa

Licensed under Patents of the Brush Development Co.



BIRNBACH IMPROVED STANDOFF INSULATORS

Are the Favorites of the Experts

Because they are made of better ceramic. Come in a complete range of heights, for condensers, coils, tube sockets, etc. Can be mounted with a minimum of labor. White glaze.

No. 430.....	3/4" 10c list	No. 432.....	1 1/2" 20c list
No. 431.....	1" 15c list	No. 432J.....	1 1/2" 25c list
No. 431J.....	1" 20c list	No. 433.....	2 1/4" 25c list
No. 433J.....	2 3/4" 50c list		



NEW LOW PRICES ON TRANSMITTING SOCKETS

It pays to buy the best so specify "Birnbach"

No. 434. 50 watt, list ea. \$1.25 No. 435. 10 watt, list ea. \$.85

Special Low Prices in Large Quantities
Ask your jobber

BIRNBACH RADIO CO.
145 HUDSON ST. BIRCO NEW YORK, N. Y.

transformer may then be reassembled in its shield and installed.

If proper components are used and no mistakes have been made in the wiring, the oscilloscope will go right to work without any adjustments except rotation of the tube so that the horizontal deflection will be horizontal and the vertical deflection vertical, and trimming of the i.f. transformer to the proper frequency.

When wiring the 913 socket the leads should be left long enough to permit 90-degree rotation of the tube. The i.f. transformer may be tuned to resonance at the i.f. frequency by coupling the grid of the 58 to the grid of the last i.f. stage in the receiver with a small mica condenser. The chassis of the scope should be connected to the receiver chassis. Then with a strong signal tuned in, the i.f. transformer in the scope should be adjusted for maximum vertical deflection. The linear sweep circuit should be used for horizontal deflection. Because the input capacity of the 58 plus the lead to the scope will detune the receiver i.f., it will be necessary to retrim the receiver i.f. for maximum sensitivity and selectivity.

Control R_5 is useful to permit some of the observed voltage to be coupled to the linear sweep to keep the pattern from moving on the screen. Resistor R_1 is the vernier sweep-frequency adjustment and SW_1 is the coarse sweep frequency control. Resistor R_{11} controls the horizontal amplifier gain and R_{16} the vertical low-frequency amplifier gain, while R_{12} controls the i.f. amplifier gain. R_{20} controls the brilliancy of the picture and R_{19} controls the focus, although these controls are interlocking to some extent and proper focus involves proper adjustment of both. The use of the other controls should be evident from the diagram and panel view.

The satisfaction derived from the use of the instrument will more than justify its cost; and not a little of the satisfaction will come from knowing that the inclusion of the i.f. amplifier makes it more complete for amateur use than most of the expensive commercial oscilloscopes.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

Harry B. Boyer, W5FRI, Youngstown, Ohio

Wm. L. Coogan, W1HZH, Winthrop, Mass.

Harry G. Cotter, W8AXF, Toledo, Ohio
Robert E. Dennis, W3DJE, Washington, D. C.

Samuel Frankel, W8BYI, Wilkes-Barre, Pa.

Jack Gaston, ex-W9ECO, Burlington, Iowa

Logan Howard-Smith, W3FBV, Rosemont, Pa.

Carl F. Wilson, W7AAW, Bonner, Mont.



BE SURE TO SEE OUR CATALOGUE IN THE 1938 ARRL HANDBOOK

Here you will find interesting information on six of our most popular transmitting units — ranging from high to low power; the compact and versatile UHX-10, the popular 80-T, the modern 700-R, the quick-shifting 200-R, the ultra high frequency UHX-35 and the multi-channel transmitters 200-S and 60-S. See them in the new 1938 Handbook. Write us direct or if you are in Boston visit our plant for any further information and prices.

HARVEY RADIO LABORATORIES, INC.

25 Thorndike St., Cambridge, Mass.

Unconditionally
Guaranteed

**PR
CRYSTALS**

Powerful
Reliable

X cut 7000 KC ± 5 KC . . \$1.85 3500 or 1750 . . \$1.65
Low Drift ± 5 KC 40-80-160 2.20

PETERSEN RADIO CO. Ex

W9JRY COUNCIL BLUFFS, IOWA W7AHE
Formerly Omaha Crystal Labs.

ORIGINAL W8UD CLASS B

UNIVERSAL TRANSFORMERS—Now Improved
MATCH ALL TUBES

50 WATTS AUDIO, PER PAIR . . . \$4.95] POST
100 WATTS AUDIO, PER PAIR . . . 7.75] PAID
ONE YEAR GUARANTEE—Write for Data Sheets

Now Sold Exclusively By
C. R. MALMGREN, W9IXR, WEYERHAEUSER, WIS.

Douglas Radio Products

Radio Operator's
Course
Telegraphy—
Telephony
Aviation



Practical
Experience
Studio—
Transmitter—
Announcing

PORT ARTHUR COLLEGE has been teaching Radio for twenty-eight years, and during this time it has never been our policy to guarantee positions to prospective students, directly or indirectly. We believe it wisdom at this time, however, to go on record in our QST advertising to say that it is impossible for us to even come near to supplying the demand for Radio Operators received by our Employment Department. We do not mean by this that all students who enroll will automatically secure positions. The demand is for graduates — good men who deserve and are qualified to hold positions. The graduates of our Radio School, so far as we know or can learn, are employed 100%.

It is possible for every student who enters the P. A. C. Radio School and completes the course in keeping with our standards to receive employment as a Radio Operator for our station

K P A C at the transmitter, in the control room, as trans-radio press operator, or announcer, and not only earn more money than he pays for the training but to also continue his training as a post-graduate student in advanced work and prepare himself to secure and hold operating positions in the upper bracket of broadcasting, marine work, announcing, or airways.

Port Arthur College advertises primarily to Radio Amateurs, and the training is too technical for the average student who has not selected Radio as his life's work. We know the opportunities for positions and advancement are unlimited for men who are interested in Radio and who plan to make this their career and are willing to make the sacrifice and effort necessary to master our training. P. A. C. maintains strict collegiate rank — only high school or college graduates are eligible for enrollment.

If interested in details about Radio Course, write for bulletin R

PORT ARTHUR COLLEGE • PORT ARTHUR (World-known port) TEXAS

(Continued from page 58)

the Club "Les Amateurs Canadiens-Francaise de la T.S.F." resulted in the following changes: pres., FS, and treas., HG, EU is still sec'y. Flash. . . . Congrats are in order for IE, a new YL operator has arrived. Will the following please drop me a line to the S.C.M. before the 16th December: AK, BQ, CY, DA, EG, FR, GD, HR, IF, JH, KP, LB?

Traffic: VE2LU 8 KF 11 EC 32 AB 7 DR 14 EE 10 KN 12 HL 6, LC 26 BE 5.

VANALTA DIVISION

ALBERTA—SCM, Alfred D. Kettenbach, VE4LX—Due to the illness of his son, LX will be absent from Alberta until March 1st. During his absence GD, of 611 First Ave., N.W., Calgary, will act as S.C.M. Please send Jim your monthly reports and notes on Ham doings. FR bought an R.C.A. 14-Mc. crystal. AAB using the Varsity Ham Club rig. AH has receiver finished. BV's junior ops went "on the air" one night when the OM and XYL were away; consequences are BV has to rebuild. LQ is the first and only ham in Edmonton to work five bands on one rig. LQ is now Official Broadcasting Station for Northern Alberta. AEA gets good results on 56 Mc. VJ and ABH are also on 56 Mc. VJ is using pair of tens in final with 85 watts input; he is the Northern Alberta representative of T9X. AGZ's new antenna works FB. HM returned from his trip down East and reports a very fine time all around; he brought back a tape recorder, so watch those fists, gang, or Chas, will put the "bee" on you. XE put in new crystal. AHY is blossoming out with a pair of '45's TNT. HJ is going to try P.P. c.c. rig. BW made trip North to install commercial rig. ABH's second op is taking over, as the OM is QRL in B. C. EA is to be congratulated upon obtaining his W.A.C. certificate. YD, new O.R.S. and on Alberta Net, will put Peace River on the map. UY makes QTH at Grande Prairie now. AAS will be on with VE5 call soon. ADD will try 28-Mc. 'phone. AEV is heard on 3.5-Mc. 'phone. IN is on again. HF and his two or three watts are sure going places. XX is series modulating on 3.5-Mc. 'phone. N.A.R.C. met Oct. 9th with good attendance; monthly raffles stimulate interest in the meetings. KI is after 14-Mc. DX. AFT still leads the traffic hounds. AJQ is new ham at Three Hills, active on 7 Mc.

Traffic: VE4AFT 38 GE 27 LQ 12 YD 8 WX 7 KI 6 QK-SW 5.

PRAIRIE DIVISION

MANITOBA—SCM, A. J. R. Simpson, VE4BG—Once again we find full operation on the Trunk Line with AAW ably holding down the job as key station for Winnipeg. GC is kept too busy at the job to put in time operating, but is there if AAW should need relief with T.L. schedules. IP completed rebuilding. Probably the most consistent 14-Mc. 'phone in Winnipeg is NI. With the arrival of a Collins 45A rig at ZK we now have ZK and KX with companion transmitters, EK and TJ have installed signal squitters. EJ is installing a new 28-Mc. antenna. JI is the Winnipeg Radio Club station. GL is installing a 35T to replace the '10's in a buffer stage. AEC has replaced his RK20 with a T35. OK is heard on 14-Mc. 'phone. QF will shortly be leaving for Kansas City to spend the winter months taking a course in aviation radio. AEO up at the Flin Flon sends in news on the boys there. WR is now located in New Westminster. B. C. IA has moved to the Flin Flon and, when not pounding brass, is busy pounding the rock roads in a gold mine company truck; he is looking for a 110-volt a.c. generator, 200 watts. Anyone knowing of such a generator should write to IA at the Flin Flon. OB is another Winnipeg ham moved to the Flin Flon. AEQ is back from his vacation with a 600-volt power supply. AEO has antenna up at the new location. AEB, whose rig at Reedy Creek came in very helpful during several emergencies, is now located in Winnipeg. CQ of Waldron, Sask., was a visitor to Winnipeg. W3IPP also visited in Winnipeg. AJC joined the Rag Chewers Club. MY has completed a new super receiver. RO works all the DX to be heard. SR has his grid-bias 'phone working nicely on 28 Mc. AFK is putting out a nice signal on 14 Mc. with a 6L6 final. AG finds 3.9-Mc. 'phone much more comfortable than 14 Mc. Reports and comments from the rural and outlying points in Manitoba would be appreciated by your S.C.M.

Traffic: VE4AAW 39 AJC 5.

SASKATCHEWAN—SCM, Wilfred Skaife, VE4EL—EL, our S.C.M., is in hospital recuperating from an operation. The gang wish him a speedy recovery. Regina hams

started off season with a banquet and election of officers: Howie Furnell, pres.; Alex Schultz, secy. XM is experimenting with aerials. A little Loud Speaker has arrived at FY's. KM is building a new superhet. SY is going to try a T55. OM is now using an HF100. AJA is a new Moose Jaw ham; welcome. OM. OP has his stick up at new QTH. MI, formerly PG, is back again working at Govt. Elevators. JV is chasing the elusive DX on 28 Mc. ZC snared an OX. RH, XY and SQ are new comers to Saskatoon. SQ is heard on 3.9-Mc. 'phone. JB is now at Yorkton. VK is on 28-Mc. 'phone with 20 watts input. OZ is busy handling traffic and studying for 2nd class ticket. ACC rebuilt transmitter to a 6L6 triode. VZ is proud possessor of an ACR-136. ABF is pleased with his vibrator power supply. PV is using 500 volts from wet batteries. MX is ready again on 3.5 Mc.

CENTRAL DIVISION

ILLINOIS—SCM, L. John Huntoon, W9KJY—Nice letter from ENH, now in Washington, who is having a swell time in a trailer just outside the city with his little 937 triode, five watts input; thirty states on 3.5. Mc. is his record. TYJ, who is burning up 28 Mc., tips us off on ZT6AK, South Africa, 28,150 kc., 1830 G.M.T. Only two reports received on the Illinois QSO Party, October 3rd, so we must declare it no contest; do you fellows want 'em or not? Reporting for the first time, OLN tells us, after four years of hamming, he is finally getting around to building a rack-and-panel job. The boys in Bloomington, BPU, MIN, MRH, SXL, et al., are firing up new rigs for the coming season. KMN is out for O.R.S. Look at VDQ's nice total, mostly from long-distance traffic to China and the far East. FB, Illinois end of Trunk Line "L" has been taken over by NFL. EBX is doubling power. RWS has a nice schedule list, covering most of the midwest; he is now on T.L. "M." "Code kings" HUM and MLH send regards from the U. of Ill. DBO is still alive—expects to be very active in the A.A.R.S. VEE is spending most of his time on A.A.R.S. work, as is KJY. AA is back on all bands. BRY is new O.P.S. WC is all settled in Elmhurst and plans to be active in O.P.S. work again. SKR is building a separate rig for 7 Mc. IX is confined to bed following a serious operation; he is operating 14-Mc. c.w. by remote control; the rig was loaned and installed by members of the Northwest Amateur Radio Club.

Traffic: W9VDQ 274 NFL 184 RWS 123 HPG 112 EBX 55 VEE 45 DDO 43 DOU 40 (WLTA 25) RMN 38 KJY 33 (WLTK 319) MRQ 29 NXG 25 KMN 9 AA 7 NHF-BRY 2.

INDIANA—SCM, Noble Burkhardt, W9QG—AXH finds DX fair on 14-Mc. 'phone. DJU is on 1.75-Mc. 'phone. EGQ has two half-waves in phase at an angle of 45 degrees. EPT, new O.R.S., leads the state in traffic. FB worked some G's on 7 Mc. FQ is moving to Chicago. Sorry to lose you. HUV's rig goes from 56 to 1.75 Mc. OVF is planning on joining N.C.R. QG keeps busy with A.A.R.S. RE visited the S.C.M. SEL is new O.B.S. for 1.75-Mc. 'phones in Indpls. area. SOK moved to Pittsburgh. SVH is operating on 7 Mc. with parallel '10's. TBM is new R.M. TE plans new 1.75-Mc. 'phone TTA says 112 and 56-Mc. activity is picking up in Kokomo. UDD is interested in organizing a dependable 56-Mc. net for Indiana. Who else is interested? WLW reports for the first time; his signals were heard in England on 7 Mc. YWE has schedules N.E. and E. ZDH worked GM6 and K6 on 28-Mc. 'phone. ZEB/8MBI is back in Indiana. ZVF applied for O.R.S. The Fort Wayne Radio Club is not expected to have meetings this winter. The Kokomo Radio Club has quarters in the Kokomo Recreation Center. The Elkhart Radio Club has 32 members. Meetings are held every two weeks at their club room at 110 E. Franklin St. AKJ is station trustee; AEB, pres.; FNP, v.-pres.; and SVH, secy.-treas. The Indianapolis Radio Club is meeting in its new quarters at the basement of 66 W. New York St. Meetings are held every Fri. night at 8 P.M. The first Indiana O.P.S. party of the season will be held Sunday, Dec. 5th, and the first Sunday of each month thereafter from 6 A.M. to 6 P.M. C.S.T. on the 3.9-Mc. band. How does this suit everybody?

Traffic: W9EPT 201 FB 2 QG 73 (WLHL 85) TBM 23 TE 4 YWE 27 ZNC 1.

MICHIGAN—SCM, Harold C. Bird, W8DPE—R.M.'s: 8LSF, 8BMG. P.A.M.: 8CSX. Michigan Eights: LSF has been appointed manager for Trunk Line "A." FX has new rig perking on all bands. FWU is running three nets now.

DYH (Ken and Polly) sports a Bliley crystal. QGD is reporting into net now. NDL had to rebuild antenna when neighbors decided they did not want it running across their property. Hope you get on your feet soon, DSQ. PFQ married and is rebuilding rig. CSL is fixing his radio room in new QTH. CCC is changing over his transmitter. DPE is still plugging for the Michigan Net. NXT is now handling morning net at 8 A.M. PBP is playing with 56 Mc. FLASH—Vee Johnson, formerly of 9PCU, Isle Royal, and now located at Lansing, expects to take the fatal leap soon. 9EXT is the lucky man. Our best luck to you both. 8IFQ of Ludington reports they are losing their FB towers on account of Salt Company taking them down. Michigan Nines: SDG joined A.A.R.S. Your S.C.M. is looking for good men to receive appointments as Emergency Coordinators. This is new appointment. Write me for particulars. Thanks for fine showing this month, gang, but let's see it grow. 73. Hal.

Traffic: W8LSF 107 FTW 56 (WLTJ 21) ONK 47 FX 47 FWU 44 DYH 42 QGD 18 NDL 14 NQ 7 NQS 5 QDX 3 DSQ 2 PPQ 1 DPE 24. W9SDG 10.

OHIO—SCM, E. H. Gibbs, W8AQ—Congrats to HCS on being the first Ohio station to make B.P.L. this season; Bill keeps 17 daily schedules to run up his total. BBH is pinch-hitting for GZ as net control of A.A.R.S. BYM handles his traffic after 10:30 P.M. UW (WLHI) is active in state A.A.R.S. Net. HTI shoves traffic along on 3780 and 3700 kc. LCY gets on for Ohio O.R.S. Net. We welcome EEQ back to O.R.S. ranks. OHP has 211 final running 155 watts on 3.5 Mc. LVU can be heard nightly on 3710 spot. HMH has been appointed R.M. for east-central Ohio. LZK is back on 3.5 Mc. Welcome to PSF, new O.R.S. APC is at new QTH in Fairview Village. PZA keeps daily schedule with PLA. Old interest in traffic is reviving at MUR. MQO moved station from store to house. NYY works 3.5 Mc. while rebuilding 1.8-Mc. 'phone rig. '47-T20-T200, with '03A's as modulators. ICQ is new O.P.S. prospect. QZA is new Piqua station. QHV works out fine on 1.8-Mc. 'phone. OHU and QNU are proud fathers of new YL Jr. ops. KYI is back on after Army work at Ft. Hayes. PUN improved rig with new buffer, power supply, antenna and break-in system. ISK is rebuilding and working DX on the side. FNX is all set on 1.8-Mc. 'phone and 14-Mc. c.w.t. NMR is assembling new transmitter and receiver. QUK has been experimenting with quarter-wave antenna for his limited space. CZR moved to Detroit. FHB is prospective O.P.S. with '47-'10-T55, modulated by '10's. Middletown Gas and Elec. hams are organizing radio club and installing transmitter. JFC worked VU2CQ to make 28-Mc. 'phone W.A.C. QUM is on 28-Mc. 'phone. LWT is experimenting with multi-band feeders. PNF reports from Bahamas where he has been visiting VP7NA. NOT has been DXing on 14 Mc. QVB, old 8DS, applies for O.P.S. Ohio Regulars Net will operate on 3710 kc. again this year, net operation starting at 6:30 A.M. and 8 P.M. Following stations are net members: LCY, APC, ICC, RN, LVU, HMH, HCS, WE, AC, KIM, LZK, LZE and BKE. Thanks to O.R.S. and O.P.S. for the fine response to S.C.M.'s letter at beginning of season. Ohio is starting off with a fine showing—let's keep it up!

Traffic: W8HCS 681 CMI 192 BYM 88 HTI 62 BBH 60 (WLHA 405) UW 40 (WLHI 57) LCY 30 AQ-EEQ 29 OHP 28 LVU 27 NKU 25 LZK-HMH 22 ICC-LVH 19 KIM-PSF 18 BAH 16 APC 11 PWY/PZA 10 MUR 9 MQO 8 NYY-QCQ-PUN 6 CVZ 6 HFR 5 ISK 4 LZE 16.

WISCONSIN—Acting SCM, Karl R. Medrow, W9AKT—HSK is doing FB job with state net. More stations are needed for general coverage. SZL sends nice report. GWK is putting last minute touches on new transmitter. Watch his smoke. IYL reports activity beginning on 56 Mc., with directional antennae under construction at AVM, IHB and IYL. ACK spent a busy summer rebuilding. CDC is getting hitched. SCR is visiting in the south. WKL has 28-Mc. bug. GSG and CDC will have new rigs. IXR is due for O.P.S. Four Lakes Amateur Radio Club installed new officers: DCU, pres.; IHB, secy.-treas.; BOP, SST and JYT, directors. BOP is also activity mgr. JYT is new Madison ham. The Rock River Radio Club sends a fine report. NRP has good luck on 56 Mc. BCV works the MacGregor Expedition at North Pole. APU will take a portable with him when he goes deer hunting. OOOY, our O.P.S., is newlywed. DIG has room for 1.75-Mc. Zepp. BCV, GTJ, TPY, YOA and RHS visited the Madison gang. ATO is relinquishing

the duties of S.C.M. in favor of his job which has kept him QRL. Good luck, Ed. To those of you that sent in report, thanks. To the rest LET'S MAKE RADIO HISTORY THIS SEASON. Help us by sending in your reports. Members of the combined A.A.R.S. and Wisconsin State Net are HSK (NCS), SZL, NRQ, VNB, ONI, JAW, HSW and AKT. SZL is on T.L. "J." GWK will soon work on T.L. "A." HGG will be alternate. Clubs and amateurs residing in cities of over 25,000 population are requested to send in recommendations for the Emergency Coordinator. ONI sends FB report for his area. DXI will soon be on after rebuilding. GYI has new Super Sky-Rider. W9RQM now has 46 countries; on 28,012 kc. he worked K6TE, Wake Island, and FY8E, Fr. Guinea.

Traffic: W9SZL 40 (N.C.R.: 4) AKT 37 DDD-BCV 2 HSK 55 (WLTD 56) HGG 8 GWK-ONI 23.

MIDWEST DIVISION

IOWA—SCM, Owen Williams, W9NNM—The 3.5-Mc. gang welcomes LEZ, who has returned to the traffic game after a couple of years fooling with DX. LCX plans a new 200-watt rig. NNM was visited by LEZ, CCE and PRR. NVF is all set for another active season. WWY schedules K60JJ each Sat. A nice bunch of traffic reports the first month of the traffic season indicates lots of activity ahead. Trunks "G" and "L" through Iowa are working nicely and can handle your through traffic. NNM and LCX are the Iowa members of these trunks. HMM shows signs of life again. NTI will be operator of Iowa City's new police transmitter. PJR sends dope on the Southeast Iowa gang. WNL is interested in traffic. UNL, the Iowa-Illinois Radio Club station, is working for W.A.S. on 14 Mc. WTD likewise. RZV and SHY are on 1.75-Mc. 'phone. New members of the club are ARE and GKN. TMY is building the gang a new super. NO expects to be on 3.5 Mc. soon.

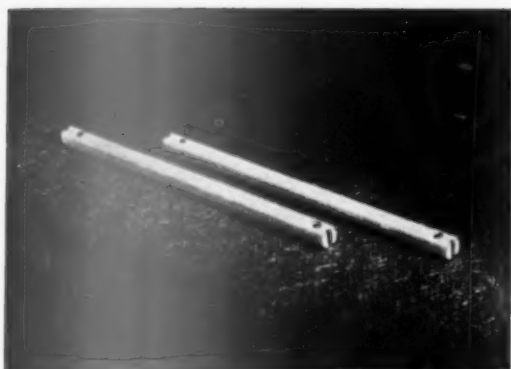
Traffic: W9LEZ 142 (WLUD 61) LCX 387 NNM 48 NVF 42 WWY 15 YBK 7.

KANSAS—SCM, Harry E. Legler, W9PB—Our former S.C.M., FLG, breaks loose with a good traffic report and also reports traffic for EYY, FER, WBC, DZI and AVW. Route Manager UEG is a busy man with Trunk "H" and National Trunk Net assignments. He is promoting a beginners net "KNTN" on 3542 kc. for those who wish to learn code, correct operating and procedure and general traffic work. The Sunflower Radio Club elected GWY pres. and VGS secy.-treas. AWB and UFP took Class A exams at K. C. Convention. YAH passed his 1600th QSO. ZBB keeps regular schedule with his brother, MCE. FRC got a 40-ft. pole set up in his back yard at the price of a case of beer. WIN gets as much fun out of ham radio now as he did in 1912. CKV says HHH is new call at Dodge City, and their club elected YAL pres. WYI now is Class A and is rebuilding for an all-band rig with 100TH final. SJV is working for a 28-Mc. schedule with west coast for traffic. After an enforced silence of about two years, ESL got on 3.5 and 1.75-Mc. 'phone and c.w. recently. YRN worked his first VK. EJD applies for O.R.S. YPM got a new Breting and rebuilt his rig plus a freq-monitor. Our P.A.M., LGR, tells the gang about it with a pair of T20's final. ZHH, just moved in from Iowa, wants to schedule other "young squirts." VQG inquires about O.R.S. for Topeka. RTZ and ZQP are getting traffic from KU hospital patients. WAZ sends his report from Colo. U. EOD reports for first time. NFG has a 500-watt rig he feels will do some good with O.B.S. and O.R.S. appointments. The S.C.M. was privileged to inspect some new television equipment at XAK and learn of plans for a modern club station at KSAC. The response to the S.C.M. bulletin to A.R.R.L. membership was gratifying, and he is trying to catch up on the inquiries for appointments. Looks like we are going to have some real activity this season. JJJ is a new ham in K. C.; he finds many operators think he is a bootlegger, but he is officially licensed by F.C.C.

Traffic: W9FLG 146 UEG 138 EYY 67 AVW 64 WRK 47 YAH 30 TWK 29 YRS 19 DZI 17 FER 14 FRC-YRQ 2 ZBB 1.

NEBRASKA—SCM, Samuel C. Wallace, W9FAM—FAM is now manager of Trunk Line "L." UHT is keeping a bunch of good schedules. EHW is active in A.A.R.S. RQR, YHN and YNO are ops at RQR, with ZPF and ZNO helping. DI attended the Kansas City Convention. DLX got new rig on 3.5 Mc. WKP reports Southeast Radio Club going fine. EDI is hitting the ball as S.N.C.S. in the A.A.R.S.

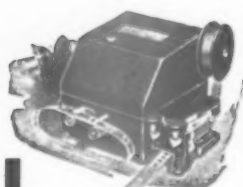
(Continued on page 110)



SPREADER: Light in weight as well as exceptionally efficient, these NATIONAL spreaders offer unusual advantages. The material is non-hydroscopic and weatherproof. The slender shape minimizes surface leakage. The power factor is of the order of 0.15%. The weight is but one ounce each. Catalog Symbol AA-3.

Net Price \$1.18

NATIONAL COMPANY, INC.
MALDEN, MASS.



At Last! A Perfected AUTOMATIC SENDER

Save your fist. Let the Automatic Sender raise your stations for you. Repeats calls or messages indefinitely. Length of messages practically unlimited. Sends from 2 to 70 words a minute. Motor driven. Entirely automatic. Built-in tape perforator. Absolute uniformity in spacing of characters. Used with buzzer or oscillator, makes excellent code teacher for novices and speed-builder for the advanced amateur. Complete with 4 rolls of tape and full instructions. No extra equipment needed.

FULLY GUARANTEED

A New High-Impedance RELAY

- Faster
- More Compact
- Quieter
- Moisture-Proof
- More Applications

Plug-in base fits UX socket
Only 1 inch wide, 3 inches tall

Ideal for use with vacuum tube. Its quiet operation, compactness, and ability to follow at speeds far above the professional "bug" make it a perfect keying relay. Can be used as a time-delay, and in many other circuits. Available in 6, 25, 50, 100, 150 volts.

\$4.50

\$6.00

Postpaid in U. S. A.

\$12.50

\$13.50
West of
Rockies
& Canada

Postpaid
in U. S. A.

Patented



If your dealer can't supply you, write us

Gardiner-Levering Co. Haddon Heights
New Jersey, U. S. A.

Standard Frequency Transmissions

Date	Schedule	Station	Date	Schedule	Station
Dec. 3	A	W6XX	Jan. 7	A	W9XAN
Dec. 10	A	W9XAN	Jan. 14	B	W6XX
	B	W6XX		A	W9XAN
Dec. 17	A	W9XAN		A	W6XX
	A	W6XX	Jan. 21	BB	W6XX
Dec. 24	BB	W6XX		A	W9XAN
	A	W9XAN	Jan. 22	BX	W6XX
Dec. 26	C	W6XX	Jan. 23	C	W6XX
Dec. 31	A	W6XX			

STANDARD FREQUENCY SCHEDULES

Time (p.m.)	Sched. and Freq. (kc.)	Time (p.m.)	Sched. and Freq. (kc.)
A	B	BB	C
8:00	3500	7000	14,000
8:08	3600	7100	14,100
8:16	3700	7200	14,200
8:24	3800	7300	14,300
8:32	3900	4:32	14,400
8:40	4000		
Time (a.m.)	Sched. and Freq. (kc.)		
	BX		
6:00	7000		
6:08	7100		
6:16	7200		
6:24	7300		

The time specified in the schedules is local standard time at the transmitting station. W9XAN uses Central Standard Time, and W6XX, Pacific Standard Time.

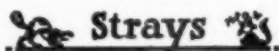
TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes divided as follows:

- 2 minutes—QST QST QST de (station call letters).
 - 3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W9XAN is "O"; and that of W6XX is "M."
 - 1 minute—Statement of frequency in kilocycles and announcement of next frequency.
 - 2 minutes—Time allowed to change to next frequency.
- W9XAN: Elgin Observatory, Elgin National Watch Company, Elgin, Ill., Frank D. Urie in charge.
W6XX: Don Lee Broadcasting System, Los Angeles, Calif., Frank M. Kennedy in charge.

WWV Schedules

EACH Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station, WWV, transmits with a power of 20 kw. on three carrier frequencies as follows: 10:30 to 11:30 A.M., E.S.T., on 5000 kc.; noon to 1:30 P.M., E.S.T., on 10,000 kc.; 2:00 to 3:30 P.M., E.S.T., on 20,000 kc. The Tuesday and Friday transmissions are unmodulated c.w. except for 1-second standard-time intervals consisting of short pulses with 1000-cycle modulation. On the Wednesday transmissions, the carrier is modulated 30% with a standard audio frequency of 1000 c.p.s. The standard musical pitch A = 440 c.p.s. is also transmitted from 4:00 P.M. to 2:00 A.M., E.S.T., daily except Saturdays and Sundays, on a carrier frequency of 5000 kc., power 1 kw., 100% modulation. The accuracy of the frequencies of the WWV transmissions is better than 1 part in 5,000,000.



And according to an AP dispatch, outdoor television pickups are being relayed to the studio by means of an ultra-violet wave transmitter!

And now . . . Improved CRYSTAL CONTROL

For the 40-METER BAND 35% MORE POWER*

For true dependable performance in the 40-meter band you'll want a B 5 Crystal Unit in your transmitter. This superior crystal unit will *carry 35% more RF current than the popular Bliley LD2 40-meter crystal unit which it replaces. It has a higher activity and is even more dependable — yet there is no increase in cost. Your distributor has the B 5 Unit for 40-meters in stock for \$4.80.



For 80 and 160-meters, your distributor has the low drift LD2 Unit in stock for \$4.80.

BLILEY ELECTRIC CO.
ERIE, PA.

For the 20-METER BAND NEW LOW DRIFT

The B 5 Crystal Unit for 20-meters brings higher standards of frequency control to the 20-, 10- and 5-meter bands. Having a drift of less than 4 cycles/Mc./°C., and a high activity, this new unit will give your transmitter a degree of frequency stability never before possible at a reasonable cost. You can get the B 5 Unit in the complete range from 14.0 to 15.0 MC. from your distributor for \$7.50.

BLILEY B5 CRYSTAL UNIT

Announcing THE FOURTH EDITION of EXPERIMENTAL RADIO

(196 p. 6 x 9 cloth. 136 experiments, 167 figures). By Professor R. R. Ramsey, Ind. Univ. A revision of the original book for experimenters and students. Diagrams drawn for power packs and batteries. Many new and original ideas. The earlier editions were the first books to contain new features which are accepted now. Of this edition again it can be said, "Ramsey manages to supply that missing fact which seems to be hidden in other books."



FUNDAMENTALS of RADIO

Second, 1935 edition. By the same author. A modern text book with a minimum of mathematics giving fundamental theory of radio. Practice may change; Basic principles remain the same. Price, Experimental \$2.75. Fundamentals \$3.50 postpaid.

Ramsey Publishing Co., Bloomington, Indiana

LEARN CODE RIGHT

Tapes for Every Need — Send You
Typical Messages by
INSTRUCTOGRAPH

It's easy and practical to learn or improve your Radio or Morse Code, any speed. Senior model with 10 tapes and Book of Instructions — \$20.25. (Rented at low cost) Junior model with 5 tapes and Book of Instructions — \$12.00. (Not rented). Complete oscillator equipment, less battery, \$6.50. Write for details today.
INSTRUCTOGRAPH CO., Dept. Q-12
112 Lakeside Plaza
Chicago, Ill.
Radio College of Canada
863 Bay St., Toronto

BUY ON CASH OR TERMS: HALLICRAFTER AND R.M. E. SHORT WAVE RECEIVERS, SPEED-X AND VIBRO-FLEXES, Telegraph Instruments.



R A D I O

ENGINEERING, broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months' duration, equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free. **DODGE'S INSTITUTE**, Day Street, Valparaiso, Indiana

THE VALPEY CRYSTALS

Step by Step Precision Made

Type LMA unit consists of an accurately cut crystal of the low drift type. The frequency drift will not exceed 4 c/m/°C. The mounting is of low loss moulded bakelite, employing tube pins for tube socket mounting. The embossed cover has the frequency accurate to within .03% stamped on it. Within 5 kc. of specified frequency in the 1.7, 3.5, 7 Mc. bands \$4.50

Type VM2 Crystals — Standard X cut mounted — supplied within 5 kc's specified freq. in the 1.7, 3.5, 7 Mc. bands \$3.00

Type VC2 — Standard X cut crystal, supplied in the 1.7, 3.5, 7 Mc. bands, within 5 kc. of freq. specified \$2.25

Complete illustrations and descriptions in our new catalogue. Order direct or see your local dealer.

THE VALPEY CRYSTALS

P. O. Box 321, Holliston, Mass.

GULF RADIO SCHOOL

Radiotelegraphy

Radiotelephony

Radio Servicing

SECOND PORT } 1007 Carondelet Street
U. S. A. } NEW ORLEANS, LA.

(Continued from page 107)

A new ham, QCW, in Lincoln, has worked all U. S. Dists. and 24 states. ZAR wants some 7-Mc. schedules. ZHJ, new ham, reports. YQX is an ex-Navy man. Incidentally FAM is the one who really got him started about 6 years ago before he joined the Navy.

Traffic: WBNT 972 (WLU 288) FAM 294 UHT 66 EHW 16 RQR 11 DI 11 UDH 6 DLX 3 EDI 69 ZAR 39.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, Lee Hughes, W5DXA—DNE leads the Section in traffic. FAJ runs four schedules. DXA has new type 807 buffer tube. EOE is rebuilding rig for EOC. CDU is working 3.5 and 7 Mc., 90% time devoted to traffic. BAM had an enjoyable trip to Panama. FMZ works 3.5 and 7 Mc., schedules on 7 Mc. EZY is building new rig with pair of 807's final. FZU is working 28-Mc. 'phone, 40 watts grid-mod. 9ZSV is operating portable in Dallas and would like some of the boys to look him up on 7181 kcs. 5FXN reports for the gang at N.T.A.C.; he has worked 39 states and 5 countries with 10 watts to a 6L6G. FSG has new Silvertone Precision receiver. BNQ is on 1.75-Mc. 'phone. FKH is getting set for 7117 kcs. FQY is active in Dallas on 7 Mc. GBC is chasing DX with 20 watts. EUY, the N.T.A.C. station, is on 1.75-Mc. 'phone with 250 watts. ARS visited the S.C.M. It is rumored that the YL has said "Yes" to FXS (of Beaumont, Texas).

Traffic: W5DNE 233 FAJ 189 EES 150 DXA 117 EOE 92 CDU 68 BAM 50 FMZ 15 EZY 3 FZU 2.

OKLAHOMA—SCM, Carter L. Simpson, W5CEZ—FSK leads Section in traffic and takes up Oklahoma position on Trunk "D." EGP is Alternate on Trunk "K" for Oklahoma, also Okla.'s new R.M. CVA changed QTH back to old location on N.W. 1st St. YJ signed up with A.A.R.S. with FRZ doing the operating. CEZ took enjoyable Naval Cruise to Canal Zone and Panama; he has been made T.L. Manager on Trunk "K." EMD broke out new bug after attending Midwest Div. Conv. in K. C. FQB returned from vacation and tour of West. DAK signed up with A.A.R.S. DUG moved from Tulsa to Washington, D. C., and is now 3GZO working 14 Mc. GBI will be on with new rig and receiver on 14 and 7 Mc. FFW got his R.C.C. and W.A.C. certificates. EGQ is rebuilding exciter for 28 Mc. EYK, ERS and FXD are snagging some nice ones on 28 Mc. FWZ took Class A exam. ATB has a pair of T200's on 14 Mc. GCE spends 5% of his time on the air and 95% rebuilding. AYF and BOR took portable job along on vacation. FLE moved from Muskogee to Tulsa. BRX works lots of DX with 90 watts on 802's. ARB has 250-WH on the air. AIR tracked down a bootleg station using call GEZ on 1.75-Mc. 'phone, and asks hams to look out for call FVU as it is being bootlegged; FVU is off but receiving lots of QSL cards. BEE has taken unto himself a YF. Congrats, Geo.

Traffic: W5FSK 354 EGP 191 (WLJL 122) CVA 163 YJ 128 CEZ 96 WLJC 93) GFT 62 FRC 45 EMD 33 FRB 19 FQB 15 BJG 14 DAK 12.

NEW MEXICO—SCM, Joseph M. Eldodt, W5CGJ—A.A.R.S. drills have started, and the boys are giving the S.C.M. something to report. DZY has moved to Arizona and is now 6OUU. DGP has been transferred to Amarillo. ENI finally got his rig going. Let's hear from more of the gang next month.

Traffic: W5ZM 140 DLG 20 ENI 19 FSP 28.

DAKOTA DIVISION

NORTH DAKOTA—SCM, Ernest Bloch, W9RZA—ZTL has a new Sky-Buddy. DOY is back in No. Dak. as chief eng'r at KRMC. EOZ visited hams in Jamestown. TQZ is press op. at KRMC. DGS left to take a job in Dept. of Commerce station in Indiana. ZDF is at Bismarck working with U. S. Meteorological Dept. SEQ rebuilt into rack and panel with T-55 final. WCY has '10's in final on 14 and 7 Mc. YVF is on 1.75 Mc. 'phone with '47 crystal—'45's modulated by '10's and uses a Super-Skydier. UGC has a '47-'46's rig and Sky-Buddy receiver. SCN is on 7 Mc. with P.P. '47—P.P. 801 rig and FB7A receiver. DM is operating on T.L. "A" and looking for traffic. PHH has new rig with 802 e.c. osc. and P.P. 807's final. RZA connects T.L.'s "A" and "H" with Canadian T.L. "I".

Traffic: W9DM 20 JMW 6 RZA 5 ZTL 2.

SOUTH DAKOTA—SCM, Andrew J. Kjar, W9SEB—Well, gang, lots of swell reports this month. Your S.C.M. takes this means of thanking you all very much. OK2PN

reports that OK2PN, OK2FO, OK2RS and OK2CC will call CQ So. Dak. starting Nov. 1st through March 31st at 0200 to 0600 GMT on 14,350 kc. and 1800 to 2300 GMT on 14,050 kc. daily. There is a chance to help our Czechoslovakian friends get So. Dak. for W.A.S. FOQ, in an effort to get his No. Dak. end of T.L. "H" started, contacted NZR in Bismarck, who in turn called GND in Grand Forks, who in turn called WLI on telephone, so FOQ talked direct to WLI with GND feeding FOQ into telephone and WLI into the mike!! This took place on 3.9. Mc. OXC is working lots of DX on 14 Mc., using new V beam. AZR reports Trunk Line "G" going well. AZR, VOD, FOQ, VQN and SEB are active in A.A.R.S. We would like to have stations from Aberdeen, Watertown, Huron, Brookings, Mitchell and Rapid City join up with the A.A.R.S. If interested, please drop a line at once to AZR or SEB. ZYD, new ham in Hot Springs, is active on 3.5 Mc. PZU's broadcasts are coming through fine each Sunday at 5:30 p.m. on 3903-kc. 'phone. OED is now located in Beatrice, Nebr. CQK and ZRA are active on 1.75-Mc. 'phone. DRB and ALO are attending weekly Morse code classes in Sioux Falls. HHW has new YL at his home. DIY is on 3.9- and 14-Mc. 'phone. OQV is at KELO. UVG has new 42-802-T55 rig on 14 Mc. YNW is on 14 Mc. ALO's Zepp came down in wind storm; he is on 14 and 28 Mc., using a 28 Mc. vertical. ZPA, new ham in Brookings, has a 59-'46 rig on 3.5 Mc. Black Hills Amateur Club held its annual picnic in Rapid Canyon, on Oct. 3rd with VOD, VQN and ZWA from Wall and ZYD from Hot Springs attending. YOB finished new 53-807 rig. ADJ rebuilt his 'phone to a T200 final. YKY is back on 3.5 Mc. CVR is on 1.75 Mc. GTG visited home in O'Neill, Nebr. QAK is active on 3.5 Mc. VOD worked both coasts within a few minutes on 3.5 Mc., using 7 watt emergency rig. FOQ is active on T.L. "H" and looking for traffic. It looks like a very active season ahead for this section, with the S. Dak. Round-up beginning to function, etc.

Traffic: W9AZR 95 FOQ 42 SEB 28 VQN 20 YOB 19 VOD 8.

NORTHERN MINNESOTA—SCM, Edwin J. Wicklund, W9IGZ—ZGT won an RK-18 at St. Paul Radio Club. ZSC's car has been popular in getting the gang to visit OPA and WLE. YCR has been on 14 and 7 Mc., using a directional antenna built in attic. ZGU has been trying some recording. TIV sent report from St. Paul. CWI, an O.O., says off-band operation is much improved. RJF is now located at Side Lake. VTH has a T55 final. DOQ is building 28-Mc. rig. JVZ showed pictures taken on his travels in Europe and So. America to gang at Duluth Radio Club. GKO and GKP are on 56 Mc. GKM and CVD are on 14 Mc. using a rotary beam. WFB works DX on 28 Mc. ZBO likes 28 and 1.75 Mc. OWU will be active from Mpls. UDK gets nice reports on 28 Mc. LSC has a T-125 final. PZU is on regularly every Sunday at 5:30 p.m. on 3903 kc. 'phone with A.R.R.L. Official Broadcasts. YAP is rebuilding his exciter to 6L6 crystal; 6L6 buffer. HEO got 28-Mc. bug after working some while visiting UDK. EU likes to be on early in the mornings. PTU and ORQ are control stations in A.A.R.S. for Minn. Your S.C.M. put up a new antenna and hopes to work you fellows with a better signal. We invite more applications for O.R.S. and O.P.S. and your monthly reports, fellows. Regards to all.

SOUTHERN MINNESOTA—SCM, W. F. Soules, W9DCM—ZNY moved his rig from the basement to a warmer climate in the bedroom. TKX finally got an antenna that would work. NUL is back on at Austin. YNQ is active in A.A.R.S. EFK has a haywire antenna hanging out of the window but it seems to work. TOF sends his first report and says he has a new 35T final on 7 Mc. QDE, a new Minneapolis ham, is starting out with a T20 final. ZQG is on 1.75-Mc. 'phone. It has been reported that DGE has not tuned his antenna for five years! YPT is on again. ZDM works the east coast with a 6L6G. ABD is putting in a T20. SIW is on 3.5 Mc. ZDU plans for 28 Mc.

Traffic: W9YNQ 30 TKX 7 ZNY 4.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, Glen R. Glasscock, W9FA—The regular T. L. circuits are again in operation and the traffic totals all take a big jump. ESA hits the high mark this month running daily schedules with 6BMC, 3QP and 7GGG. TDR piles up good total by working daily schedules as well as plenty of A.A.R.S. work. EKQ, the liaison R.M. for A.A.R.S., comes along with a heavy total by doing daily duty on T.L. schedules. Any of you fellows interested in

A.A.R.S. appointments, traffic schedules, etc., just get in touch with ESA for full particulars. VGC is putting in quite a bit of time on 28992 kcs. YFM has been dolling up the new superhet. CAA got up new stick at new QTH. ECY has been busy with construction of a small battery operated transmitter. WWB is on the air 'most every day for traffic. LQO and GLI (YF and OM) keep the rigs pretty busy around their place, A.A.R.S. and N.C.R. under one roof!! NFO and TRO are rebuilding. SZS sold his rig. WAJ is taking up his duties with T.L. "G". DDF becomes O.B.S. station for the gang on 1.7 Mc. 'phone band; look for Ralph every Monday at 7:30 P.M. GDC has moved to Fruita. IGM is working portable at Dillon. TLM is frequent visitor at WMT in Pueblo. WTN has been working 28 Mc. quite a bit. ZBN is a new member of the Colo. A.A.R.S. 'phone net. PPU lost his skywire when the wind blew too hard. SPO has a new PR15 for QSO's on 14 and 28-Mc. 'phone. NWW is waiting for a new NC81X. UJS is going places on 14 and 28 Mc. 'phone. WSE and his new Johnson "Q" started things going in Europe and he has cards to prove it. ZJM is working 28 and 1.7-Mc. 'phone on a 24 hour shift. SIE is the proud possessor of a new 'scope. ZEF has a low power rig on 1.7-Mc. 'phone. SPO has a second opr. about ready for his ticket. XYZ at Boulder gets to Denver every weekend to work on that new motor driven rotary beam. FUH keeps the 22 watt portable going while rebuilding the 1 kw. rig. PZF and WJJ sport new RME69's. PGS has a pair of TZ20's to bite a hole in the ether. CJJ changed QTH and put up a rhombic. AUJ is back in Denver. EMU rebuilt his final for 14 and 28 Mc. 'phone. BTO finished his new exciter unit, tested it and it worked. ZDZ changed QTH to Steamboat Springs. EHC changed QTH. FXQ had to go to the mountains on an all-winter job. HDU, back home from the hospital, has a Johnson "Q" for 28 Mc. JAV has been active on 56 and 1.7 Mc. LFE is building an aircraft transmitter for the Nat'l Guard. LIU is active on 56 and 1.7 Mc. LIU and JAV held daily schedules all summer. LIF is trying to sell his O3A rig. NHI is working on a 3-inch oscilloscope outfit. NRZ is working 3.5 Mc. QBH was transferred to a C.C.C. Camp where only d.c. is available. QBG is now working at the Fountain Valley School. TFT finished his FB T55 rig but didn't like its looks so tore it up and started over! WXK/9 was working portable in Colo. Springs during hunting season. YAE has his 42A final amp. ready to go. YLT is batting 'em off on 7 Mc. with his 616—two 6L6's. YYO completed his 36 tritet—RK39 rig. YZS is back after a pleasant summer in New Mexico. ZBS is now working at the Union Printers Home. ZCM took a look at the first snow on the Peak and then left for Florida. ZFM bought out HDI and now has a good stock of parts, including a new T55. ZOK pops up with a Telephone First ticket. ZXU is having UEL build him a 616-RK39 rig. 9JJU is new YL opr. in Rocky Ford. Get in line, youse guys! FDP will be heard from Delta this winter. TTD is O.R.S. now. SBB reports everything fine over in Gunnison. At the fifth anniversary dinner of the Rocky Ford Club TDS was elected pres., TTD, vice-pres.; ex-OYE, secy., MDN and Lloyd Ferris directors. 5CGJ, S.C.M. of New Mexico, was a visitor in Denver recently. SPU rewound a Ford generator for 100 watt a.c. output. GHY has been getting the P.A. system at Mines ready for the football games. ZMI has a 42 crystal and 42 final modulated with a pair of 42's on 1.7-Mc. 'phone. KNZ is working on a 56-Mc. e.c. high output rig. ZMH and GHY are on 1.7-Mc. 'phone. VQY is proud owner of a new Super Sky rider. LYV poured out the sheckels for a Breting 12. ODF swapped off the SW3 and now has an FB7. 7EVN of Casper, Wyo., visited Denver and took home an ACR136. PIY has the 860 stage ready to go. OKH changed QTH and entertained his new neighbors by putting up a rotary beam. RTQ moved back to Grand Junction and is copying press for KFXJ. PWO took his annual vacation, stopping off in Colo. Springs and Denver. All the 12th Naval District N.C.R. gang enjoyed a round table QSO party on the 19th of Oct. JFD is back on the N.C.R. circuits. VCN and LFA work nights so their brass pounding is day-time stuff. BYV, FYY and BTO have been putting in their drill nights painting the new N.C.R. quarters in the Old Customs House. DSD has been working on the transmitter to be installed at N.C.R. quarters under the call QBI. REU finds time for N.C.R. drills. NLN, WUE, WTW, TSQ and TEJ have been keeping the Pueblo end of the N.C.R. working well. UXX is new N.C.R. member in Pueblo. GCM is getting a number of embryo hams in Grand Junction ready for their tickets and membership in N.C.R. Anyone

interested in N.C.R. work get in touch with the S.C.M. and full particulars will be sent at once. GBQ had a gang of the Denver boys out for a Sunday outing and made them put up two telephone poles in series before he'd feed them—Eddie now has a new 14 Mc. Vee beam antenna. NUZ has been doing a little boning up on code with the help of OUI. About 60 of the hams in and around Denver met at the home of BJN when Byron Goodman stopped off in our fair city to discuss A.A.R.L. ham operations, or what have you. Everyone had a swell time, especially when Mrs. BJN came out of the kitchen with pumpkin pie and coffee.

Traffic: W0ESA 640 EKQ 426 TDR 166 GLI 122 DDF 66 TTD 45 LQO 38 TDS 34 WWB 31 MDN 25 ECY 14 IGM 14 ZBN 12 TLM 11 GDC 9 WTN 7 CAA 5.

UTAH-WYOMING—Townsend J. Rigby, W7COH, SCM—7GEE is back in harness at Laramie. 7DIE is organizing the Rock Springs and vicinity hams into a new club. 7AMU is getting the Wyoming A.A.R.S. gang together for the season. 7DES is working lots of DX. 7EVN is lining up rig for winter season. 7CLG has new receiver and expects to go to town in A.A.R.S. and traffic work. 7GHF is working the country over and a few K6's on 7 and 14 Mc. 7GHF's hubby is getting their FB rig on 7, 14 and 3.5 Mc. with about 450 watts. 9PDP-7 keeps some regular schedules on 7 Mc.; he has a new Breting receiver. 7CDH, Yellowstone Park, is forced to leave Wyoming on account of his health; he goes to Phoenix, Ariz. Good luck, Walt. 7AAT is busy in A.A.R.S. 7GFB is doing FB job as alternate for 7AAT. 7COH is manager of Trunk Line "G". 6OKF, Honeyville, Utah, schedules 6GRB daily. 6LLH has been appointed R.M. in Utah so get behind him boys and do your stuff. 6FYR is now on Trunk Line "B". The Dr. has ordered 6BLE to QRT radio for a time, but he still gets on occasionally. 6GRB joined the A.A.R.S. 6NPU worked on Russian and has had several Asian contacts. 6IWY is out of hospital, minus an appendix. 6GBO is having lots of fun on 28 Mc. The Ogden Amateur Radio Operator's Club held its election of officers on Oct. 5th. 6GRB, pres.; 6GBO, vice-pres.; 6MDP, sec.-treas. 7CGC' Granger, Wyo., is rebuilding more compactly. 1.75-Mc. 'phone. 7GKG, Granger, is building with 100TH in final. 7FQU operates 3.5 and 7 Mc. Active on 7 Mc.: W6BPB, LPP (Milford, Utah), NZF, OQO, ORH (ex-shop operator), NMK, CQR (Park City, Utah), OVP. Active on 14-Mc. 'phone: BBWU.

On Oct. 13th the Casper Radio Club was host to Mr. Bryon Goodman, Asst. Secretary of the League. His talk on League matters and also technical advice was intensely interesting to all. Those present were E. E. Parshall, Ken Shultz, A. F. Pickett, Frank Sherard and T. J. Rigby, SCM Utah-Wyoming; all of Midwest; K. L. Long, S. H. Vanburgh, H. McFarlane, J. B. Reasoner, Chuck Burdick, G. E. Gay, L. D. Branson, Willis Peake, Gail Davidson, H. G. Lowman, Floyd Wickencamp, Bob and Stacy Anderson, Virgil Crum, Burris Thomas and R. R. Crum. The meeting was held at the home of R. C. Crum. "Hot Dawgs," cake and ice cream were served.

Traffic: W7GIE 51 W6PKF 5 7AAT 8 7AMU 12 7EOT 8 7CBL 2 7DIE 8 7CLG 8 6GRB 5 MDP 22 KMA 25 7COH 16.

SOUTHEASTERN DIVISION

ALABAMA—SCM, James F. Thompson W4DGS—R.M.'s: 4DS, 4CRF, 4APU. P.A.M.'s: 4DHG, BMM. About the most startling new this time is that CNY and "angel puss" are taking that fatal plunge into holy matrimony. Congrats to both of them. APU is chasing DX again; he has a fancy 14-Mc. ant. with 4 half waves in phase. New QTH's for EBB and AWQ. The B'HAM Amateur Club had another fine function on Oct. 14th at the club house. EVS has new rig with 24 osc., 45 and pair '10's. EJQ is going strong on 28-Mc. 'phone. EUZ has high power fever for 1.75-Mc. 'phone. LT is back on 3.9-Mc. 'phone after a long absence. EDW has a new high power rig with 211 P.P. final DHG, our Phone Activities Manager, would like to hear from some of the fellows who have those signals with BC quality. They should have O.P.S. appointments if their operating practices are OK. DQW is commandant at C.C.C. NR, 4404 in La. EBZ reports for the Tusky gang-EYV is a new call. EQG has new super sky rider. IHFO/4 schedules home via CRG on 14-Mc. 'phone. EBZ needs two schedules per day with B'ham-EPE and EOX—to handle all his traffic. ELN and ELP are roommates at U. of Ala.

Universal Mounting



DYKANOL TRANSMITTING CAPACITORS *Type TJ-U*

SIMPLE, effective universal mounting bracket, now supplied free of charge with all C-D Dykanol Type TJ-U Transmitting capacitors. "Hams" the

country over agree that this capacitor is the most attractive value in the industry.

Other outstanding features of this fine capacitor are:

- ★ Dykanol Impregnated and filled.
 - ★ Hermetically sealed in non-corrosive containers.
 - ★ The only oil capacitor that can be safely operated at 10% above rating.
 - ★ High glazed porcelain insulators.
 - ★ Available in a complete capacity range from 600 to 25,000 V.D.C.
- Don't be satisfied with imitations—Demand the original oil condenser —C-D type TJ-U

Described in complete detail in catalog 151A free on request

Write for your copy to 1013 Hamilton Blvd.,
South Plainfield, New Jersey

CORNELL - DUBILIER



ELECTRIC CORPORATION

South Plainfield, New Jersey

Coto

CONTROL WHEELS

ATTRACTIVE—BALANCED—MODERN



2 1/4" — TWO SIZES — 3 1/4"

LENDs DISTINCTION
TO YOUR RIG!

See Them at Your Jobber

RADIO



PRODUCTS

COTO-COIL COMPANY, Inc.

229 Chapman St., Providence, R. I.

Export address—100 Varick Street, N. Y. C.

A 56-Mc. Portable Mobile

(Continued from page 39)

the speaker, and two red jacks for 'phones for duplex. One side of each of these circuits is grounded so there is no d.c. potential on anything—a great help when in a wet location. This also makes it possible to use a standard telephone handset for duplex operation; the common microphone and phone lead of the hand set is plugged into one of the grounded jacks, the microphone lead into the ungrounded microphone jack, and the 'phone lead into the "hot" 'phone jack. The control to the right of these jacks is the receiver regeneration control.

In the lower right-hand corner is the 5-prong power socket. When working from the 250-volt 50-ma. a.c. power supply, a power plug is inserted which furnishes 6.3 volts a.c. to the filaments and the d.c. potential to the plates. The plug used with the genemotor supply brings in the B-plus and connects the filaments into the battery circuit, as shown by the dotted lines in the circuit diagram. The B-minus is grounded to the case containing the genemotor and filter. No special 5-meter filter is needed with this power supply.

Looking inside the case the modulation choke and 41 modulator tube are mounted next to the transmitter shield, and the first audio tube next to the detector switch. The microphone transformer is mounted under the chassis.

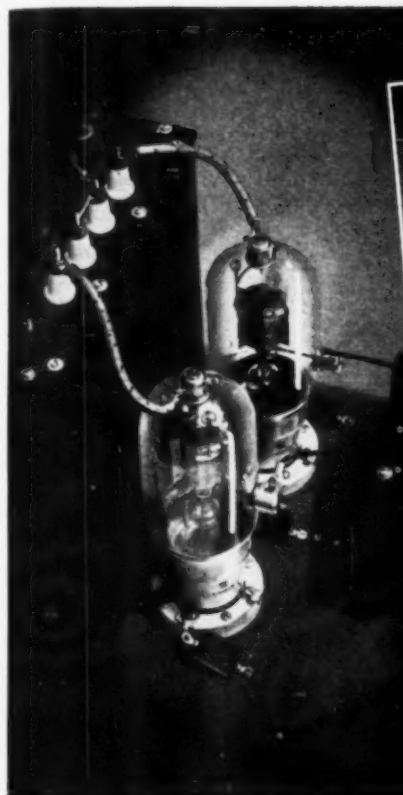
This outfit has a total power consumption of about 50 ma. at 250 volts when working duplex. In spite of the low power, it gets out very well when used with a suitable antenna. The transmitting antenna used on the car is a 37-inch aluminum rod with the bottom end grounded to the center of the rear bumper of a coupe. This rod is fed at the top by an 8-foot wire to one terminal on the transmitter. This makes a 3/4-wave antenna with the far end grounded, when the loading at the transmitter end is considered. The length of the vertical rod was adjusted with a field strength meter for best results.

How Would You Do It?

(Continued from page 40)

with plate glass. He obtained a piece from an automobile "graveyard" at a reasonable price. The superior strength of plate glass helps to prevent breakage in drilling and from unexpected strain from the transmission line. The line is, of course, anchored to the outside wall before passing through the glass. W1AUN recommends the method of drilling described in *QST* for October.

One idea of which we have heard several times, although we have never seen it tried, is suggested by George Smith of Chicago. The scheme consists of two sheets of heavy tinfoil or possibly sheet metal, one on each side of the window pane, which form a series condenser with the glass as the dielectric. Pieces six or eight inches square should



GAMMATRON

for Improved Class "B"
Audio Amplification

354-E $\mu=35$

354-F $\mu=50$

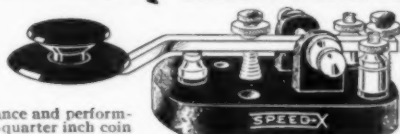
- MIN. BIAS REQUIREMENTS
- VERY LOW DISTORTION

HEINTZ AND KAUFMAN
SOUTH LTD. CALIFORNIA
SAN FRANCISCO U.S.A.

SPEEDX

THE COMPLETE LINE
OF TELEGRAPH KEYS

THE
LAST
WORD



in appearance and performance. One-quarter inch coin silver contacts — well insulated for heavy duty work. All parts chromium plated — choice of black wrinkle or chromium base.

No. 320. Black base. List \$3.25
No. 321. Chrome base. List \$3.50
Other models of hand keys from \$1.50 to \$3.50 list — Available at leading jobbers everywhere.

Write for new literature and amateur discounts

LES LOGAN CO.

646 Jessie St.

San Francisco

LEARN RADIO

— TELEVISION —

New Beginners' Class Jan. 17th. Send for 48-page catalogue, explains fully, 500 licensed graduates placed in last six years in broadcasting, shipping, police radio, aviation, etc. Oldest, largest and best equipped school in N. E. We teach all branches of radio. Tel. HAN. 9184.

Ten operators placed with Pan-American Airways in one week.

Radio Service Instructions Given

MASS. RADIO SCHOOL

18 Boylston Street, Boston

Meissner

CHOKES for TRANSMITTERS



Tapered
Six Section Winding
Dist. Cap. 1 mmf.
Metal Mounting Brackets
Ceramic Dowel

No.	Rating	Inductance	Resistance	List
3019	1000 MA	2.8 MH	5	\$1.50
3022	500 MA	5.5 MH	12.5	1.50
3025	200 MA	5.9 MH		1.50

FREE: — Write to Dept. M-2 for our complete 32-page Coil Catalog

MEISSNER MANUFACTURING CO.
MT. CARMEL, ILLINOIS



NEW HOLDER DESIGN

15 SECONDS TO
INSTALL CRYSTAL

For All Bands

GREATER STABILITY

Plugs in 5 prong tube socket

Beautiful Appearance

MODEL AH HOLDER \$1.00 At your dealer or direct

HIPOWER LOW DRIFT CRYSTALS:
within 10 kc. or Choice of stock

AH-10, 1700-3500 Kc. bands \$2.35

AH-10, 7000-7300 " bands 3.90

WRITE FOR NEW LITERATURE

Hipower "Low Drift" Broadcast and Commercial Crystals Are Approved by F.C.C.

Hipower Crystal Co., 2035 Charleston St., Chicago

THE RADIO AMATEUR'S *Library*

For some time our advertising in *QST* has carried a by-line reading "Number in the Series entitled Radio Amateur's Library." Many requests have been received for copies of this list and now we present it in *QST* in its complete form — to give a comprehensive picture of our publishing services to the amateur.

No.	Title	Price
1.	<i>QST</i>	\$2.50 per year*
2.	List of Stations	Pre-war Out of Print
3.	Map of Member Stations	Pre-war Out of Print
4.	Operating an Amateur Radio Station (Formerly called Rules & Regulations of Communications Dept.)	Free to members; to others 10c
5.	The Story of The A.R.R.L.	Out of Print See No. 13
6.	The Radio Amateur's Handbook	\$1.00**
7.	The Log	35c each; 3 for \$1.00
8.	How to Become a Radio Amateur	25c
9.	The Radio Amateur's License Manual	25c
10.	Hints & Kinks for the Radio Amateur	50c
11.	Lightning Calculators:	
	a. Radio (Type A)	\$1.00
	b. Ohm's Law (Type B)	1.00
	c. Wire Data (Type C)	50c
	d. Decibel (Type D)	50c
	e. Parallel Resistance — Series Capacity (Type E)	50c
	f. Resistance Calculator (Type F)	50c
12.	Amateur Radio Map of the World	1.25
13.	Two Hundred Meters and Down: The Story of Amateur Radio	1.00
14.	Building an Amateur Radiotelephone Transmitter	25c

*In the United States and Possessions and Canada.
Other Countries \$3.00 per year.

**Postpaid in Continental U.S.A. — \$1.25, postpaid, elsewhere.

**THE AMERICAN
RADIO RELAY LEAGUE, INC.**
West Hartford, Connecticut

provide sufficient capacity to have little effect upon the line. The chief difficulty with tinfoil would seem to be a satisfactory method of making a good electrical and mechanical connection to the tinfoil, while the metal plates present a problem in sticking them to the glass. Ring-shaped plates fastened to the glass by means of rubber suction cups at the center have been suggested. Possibly someone has tried this stunt and can advise us of its practicability.

The old trick of lowering the upper sash or raising the lower sash and inserting a board carrying feed-through insulators was suggested in several forms. The chief objection to this is usually

Problem No. 12

O. H. has been doing a lot of hot DX work lately and already he has so many cards that the situation is rapidly getting out of hand. Naturally he wants to make a display of them on the walls of the operating room but he hates to start putting them up until he has some scheme that will allow a higher order of neatness and convenience than that seen in most shacks. The walls, as it happens, are plaster and our friend agrees with the O. L. that tacks are out. He wants a scheme that will permit ready replacement of the cards without marring their beauty and one that will present a really orderly appearance. Further, O. H. can't help thinking that there must be some inexpensive way of providing against fly bites and dust—some sort of cheap protective surface covering. What say?

the resulting crack between the window and the board and the gap between the upper and lower sashes. A very satisfactory method of securing a tight joint between the window sash and the lead-in panel, shown in Fig. 1, is described by P. D. Lawrence of Richmond, Va. If the panel is placed under the lower sash, the top edge of the panel is fitted with metal weather stripping. This requires grooving of the lower side of the sash.

A method which eliminated the necessity for grooving is described by J. M. Overman of Norfolk, Va., and is shown in Fig. 2. A fairly thick lead-in panel is required. The upper and lower edges of the panel are cut out to make overlapping joints with the window sash and frame or sill. He takes care of the gap between the sashes by tacking a piece of rubber inner tube, cut to fit, to the top edge of the lower sash.

The somewhat different arrangement shown in Fig. 3 is suggested by W5GNV. He uses a glass cutter to remove a strip of pane about five inches high. A section of wood or Masonite is substituted for the glass. The edge of the section is stepped to make an overlapping joint with the glass and the joint is plugged with putty. Of course, the transmission line moves up and down with the window unless the section is placed in the stationary sash and the arrangement does not permit complete screening of the window.

W2FFT and W8NXXR provide the lower edge

STATION OPERATING SUPPLIES

For full enjoyment of your operating activities
you will want these forms designed to meet
your needs



HANDY TO USE

The most interesting feature of the new LOG BOOK is the incorporation of spiral binding. This permits the book to be folded back flat at any page, requiring only half the amount of space on the operating table and making it easy to write on. The log-sheet has been re-designed by the Communications Department so that there is space provided for recording the number of messages handled and QSL's sent and received. General log information (prefixes, etc.) has been brought up-to-date. The LOG BOOK price has been reduced and is now 35c per book, 3 books for \$1.00, postpaid.

FOR PRESTIGE

The radiogram blank is now an entirely new form, designed by the Communications Department to comply with the new order of transmission. All blocks for fill-in are properly spaced for use in typewriter. It has a strikingly new heading that you will like. Radiogram blanks, $8\frac{1}{2} \times 7\frac{1}{4}$, lithographed in green ink, and padded 100 blanks to the pad, are now priced at 25c per pad, postpaid.



FOR CONVENIENCE

Radiogram delivery cards embody the same design as the radiogram blank and are avail-



able in two forms — on stamped government postcard, 2c each; unstamped, 1c each.

AMERICAN RADIO RELAY LEAGUE, INC.
WEST HARTFORD, CONNECTICUT

Get on the Air FOR ONLY \$88.00 BUILD THE PROGRESSIVE III (Send for New Bulletin 50 — FREE) Fully Equipped — NET

NO headaches, no "extras" to buy, no time wasted. You can build the exciter and low power stages of the famous PROGRESSIVE III for only \$88.00. That includes everything needed — tubes, crystal, meter, etc.

Then, when you're ready to add phone or more power, you keep right on building, without tearing down what you've got or discarding parts.

GET READY FOR DX CONTEST

This famous rig is making DX records all over the country. You'll want yours for the big DX Contest. It is built with standard parts, obtainable from your jobber. Panels and chassis come completely drilled, with sockets installed. Only a screw driver, pliers and soldering iron needed to assemble it. Complete, easily followed directions in AMATEUR TRANSMITTER MANUAL, 25c from your jobber or Amateur Press, 333 Throop St., Chicago.

**GENERAL
TRANSFORMER CORP.**
1288 W. Van Buren Street
CHICAGO

ANTENNA
TUNER
BUFFER &
FINAL P.P.
AMPLIFIER

EXCITER UNIT
(CRYSTAL
OSCILLATOR
& BUFFER)

LOW POWER
UNIT

MODULATOR
& POWER
SUPPLY

HIGH POWER
UNIT



The chassis mount on rack
or in metal cabinets

Every DX'er Needs This Clock— WORLD TIME at a glance!

GORDON NAME PLATES

ANTENNA TUNING

A complete line of 106 beautiful, chromium plated name plates, available in two sizes. Write for listing and low prices on these ever-lasting name plates for Transmitters, Sound and Test equipment.

GORDON SPECIALTIES COMPANY
440 SOUTH DEARBORN STREET • CHICAGO, ILLINOIS

You're there ON TIME with a World-Wide clock! One quick glance gives you Standard or GMT time, accurately—instantly—for any one of the twenty-four time zones around the world.

This 24 hour time-piece, has a genuine Waltham movement. Attractively colored dials plainly marked for direct reading. Self-starting. Operates on 110 volt, 60 cycle, AC.

Here is a beautiful, practical instrument you'll be mighty proud to own! Black satin-finished metal base, removable for flush-mounting in your panel. (Hole size 3-11/16"). Only \$9 net to licensed hams. Get yours today! See your jobber. Inquiries invited.

of the lower sash with feed-through contacts. The contacts are closed when the window is down, but jumpers are required if it is desired to use the antenna with the window open. This scheme is less adaptable to tuned lines.

Several of those who submitted papers pointed out that the Underwriters' requirements may be met satisfactorily by mounting the grounding switch inside the house. However, it is usually desirable to be able to open the window for other purposes, especially during warm weather.

We have selected the following prize-winners:

First—John R. Sanders, W5GNV.

Second—J. M. Overman, Norfolk, Va.

Thanks to the following for their efforts on the problem: W1JZU, 2HAP, 5EZA, 5FWA, 8BKE, 8OMM, 9CDU, G2BZK, VE3ACM, D. A. Beuk and F. H. Kistler.

—D. H. M.

And again the contest rules:

1. Solutions must be mailed to reach West Hartford before the 20th of the publication month of the issue in which the problem has appeared. (For instance, solutions of problem given in the March issue must arrive at *QST* before March 20th.) They must be addressed to the Problem Contest Editor, *QST*, West Hartford, Conn.

2. Manuscripts must not be longer than 1000 words, written in ink or typewritten, with double spacing, on one side of the sheet. Diagrams and sketches may be in pencil, must be neat.

3. All solutions submitted become the property of *QST*, available for publication in the magazine.

4. The editors of *QST* will serve as judges. Their decision will be final.

Prizes of \$5 worth of A.R.R.L. station supplies or publications will be given to the author of the solution considered best each month, \$2.50 worth of supplies to the author of the solution adjudged second best. The winners should, of course, state the supplies preferred.

K7EVM, Fort Yukon, Alaska

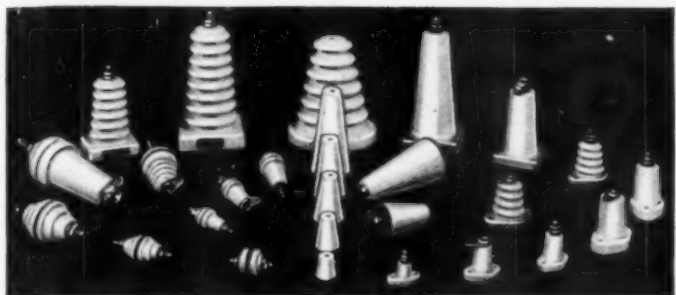
(Continued from page 48)

crete. The engine room is partially heated from the house through vents so that I have to heat the engine oil each time I intend to operate. Consequently in winter I wait until I am sure the band will be alive before I start up—sort of slow business. If the engine gets too hot in winter I open the outer door and let a little 40-below air in.

"Gasoline is rather high-priced here—seventy-five cents a gallon—so I usually run the engine only for 20-meter work, though I have coils for 80, 40 and 20 for each of the transmitters. Usually the 42 is left on 80 and the 46's on 20.

"I have only one transmitting antenna at present, a Zepp-fed 133-foot one running true north and south. This seems to work well for the States, Europe and Australia. Guess I will have to put up another antenna and try to get into Asia a little better. South America, of course, is a hard nut to crack due to the heavy QRM from the W's. I have had only one PY contact but that

A JOHNSON INSULATOR for EVERY PURPOSE



Discriminating radio men have standardized on Johnson Insulators . . .

BECAUSE . . . there is a better Johnson insulator for every application

BECAUSE . . . Johnson Insulators combine effective insulation with high mechanical strength, without excess bulk.

BECAUSE . . . exclusive Johnson features offer the most in utility and convenience.

BECAUSE . . . Johnson insulators cost no more than substitutes.

E. F. JOHNSON COMPANY
MANUFACTURERS OF Radio Transmitting Equipment
WASECA MINNESOTA U.S.A.
 Export Office: 25 Warren St., New York. Cable: "SIMONTRICE"

The Johnson line of Stand-Off and Thru-Panel Insulators originated more than ten years ago with a single unit, No. 20, still one of the most popular numbers. In ten years this line has grown until it now includes 45 different insulators, 27 of which are illustrated.

Johnson porcelain insulators have long been accepted for the superior quality of material used. Now many types are available in genuine *Alsimag* 196 Steatite, a material possessing unusual qualities for high frequency use, including a loss factor of one-third that of similar materials.

For complete information on these and other Johnson products, ask your jobber or write for Catalog 964J.

RADIO ENGINEERING



RCA Institutes offer an intensive course of high standard embracing all phases of Radio. Practical training with modern equipment at New York and Chicago schools. Also specialized courses and Home Study Courses under "No obligation" plan.

Illustrated Catalog on request

RCA INSTITUTES, INC. Dept. ST-37

A Radio Corporation of America Service
 75 Varick St., New York 1154 Merchandise Mart, Chicago

SPECIAL TO AMATEURS

Piezo-Electric Crystals — \$2.50 EACH POSTPAID

Until supply is exhausted . . . we offer 80 meter band crystals unmounted; accurate calibration, excellent oscillators. Limited quantity.

SCIENTIFIC RADIO SERVICE

"The Crystal Specialists Since 1925." University Park, Hyattsville, Md.

American

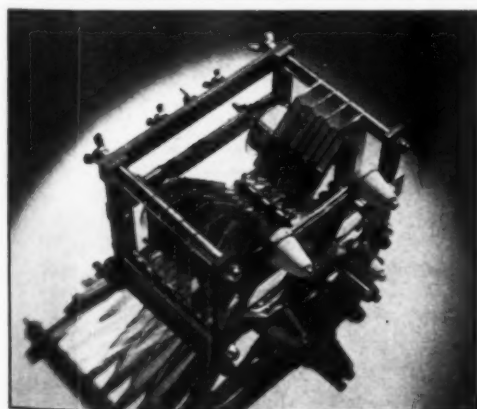
CRYSTAL MICROPHONES

are being used with enthusiasm by Amateurs and Public Address men throughout the World. Noted for excellent Quality and the Versatility of its mountings.

Licensed under patents of The Brush Development Co.

AG Directional C-5 Non-directional

AMERICAN MICROPHONE CO., Inc., Ltd.
 1915 S. Western, Los Angeles, Cal.



NEUTRALIZING CONDENSERS

Built-in on your plate or grid tank condenser. An IDEAL factor for a balanced amplifier, engineered with short, symmetrical leads in mind.

These disc-type neutralizers may be had in three sizes, which will handle any of the "low C" tubes from the big 450T on down.

Model ABC 6025-N2 shown. All RF insulation LDS Mycalex. 60mmf at 1/4-inch airgap per section. Two neutralizing sections 0.4 to 4mmf/section. Other spacings and capacities available.

Write for information

W6VX ATKINS & BROWN W6HB
 215 Fourteenth Street Oakland, California

NDISPENSABLES

- ✓ *your receiver*
- ✓ *your transmitter*
- ✓ *your F.C.C. licenses*
- ✓ **your LICENSE MANUAL!**

It's against the law to operate an amateur radio station without the required federal licenses for station and operator. The maximum penalty for so doing is a \$10,000 fine and two years in a federal penitentiary.

That's the broad basic picture. But within the scope of the federal licensing machinery are many detailed regulations, the violation of any one of which can lead to suspension, cancellation of licenses, or even fines or imprisonment. These regulations change frequently, in step with the rapidly developing art of radio.

There is only one way for the amateur to keep at his finger tips these changing legal requirements—short of maintaining his own Washington legal bureau. That is to keep the latest edition of the Radio Amateurs License Manual in the shack at all times. New editions always contain the latest regulations—and when a new edition appears it means that changes in federal regulations have made its predecessor obsolete.

WE ARE NOW SUPPLYING THE EIGHTH EDITION
TAKE A LOOK AT YOUR COPY!

25 cents postpaid

AMERICAN RADIO RELAY LEAGUE

West Hartford, Connecticut, U. S. A.

is enough so far as a WAC is concerned. Have had only one African contact so far.

"Fort Yukon is located just over the line inside the Arctic Circle at the junction of the Porcupine and Yukon rivers. The name dates back to about 1840 when the Hudson's Bay Company established a trading post here. At that time they thought they were in Canada. Consequently it is the oldest town on the upper Yukon.



"Being inside the Arctic Circle, we can see the sun at midnight for a week or so in June. In December the conditions are reversed with very long nights. The sun is visible by refraction for an hour and a half during the shortest days. The temperature ranges are extreme here; in the summer with continuous daylight it gets to 80 in the shade and the coldest in the four years of my residence here has been 78 below zero.

"I made my start in radio back in 1914 but dropped it until I came up here. I still have the Brandes headphones that I bought then and use them at times. Our mail service is very slow here in winter (dog team) and it took nearly six months to get my license, which was issued in January, 1935. For the first year and a half I used only a battery layout, working on 80 entirely.

"Amateur radio has grown considerably in Alaska since I first got on the air. A considerable network has grown up now and many places that formerly had no communication at all use ham radio with satisfaction. For instance, I maintain a sked with my nearest ham neighbor to the north, VE5QB, which means many hundreds of dollars' worth of business to the local store keepers. We also keep the traders at VE5QB advised as to fur prices, which is worth while to them. Fur is the only product of this region.

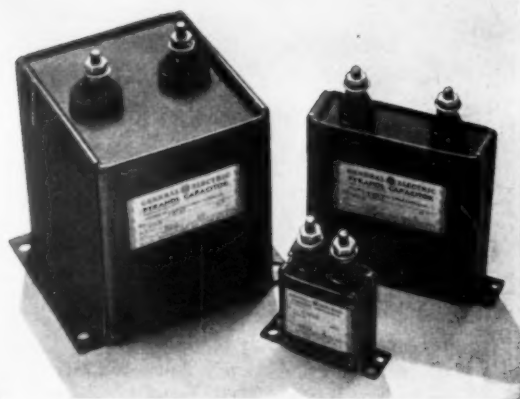
"In the spring the rivers break up with a rush, and this year we had an ice-jam which caused the water to overflow in the Yukon and put four feet of water in the house. So I moved the rig upstairs and provided the only communication, as the commercial station was out of commission. Then I had to go down, after the water receded several days later, and put the commercial station back on the air. It is a 'phone station in one of the stores and the operator knows nothing about radio!

"Ham radio is not a toy up here but a real part of our lives and *QST* the bible. More power to you."

"I NEVER WORRY ABOUT MY G-E PYRANOL CAPACITORS"

THAT'S what one ham wrote us three years after he had installed G-E Pyranols in his rig. And why should he worry? These hermetically sealed, Pyranol filled units are truly dependable. They must stand up under a double-rated voltage test, and can safely be operated at 10 per cent above rated voltage. Pyranol, General Electric's well-known, high-dielectric-strength insulator, will not burn.

There are other reasons why you, too, will



prefer G-E Pyranol capacitors. One is the new clamp-type brackets, which hold the capacitors securely in place at all times. See your dealer about these capacitors, or write Radio Department, General Electric Company, Schenectady, New York.

GENERAL ELECTRIC

Filing No. 6900

900-8

AMATEUR RADIO *Map of World*

I.A.R.U.—W.A.C.

All known districts
and sub-divisions

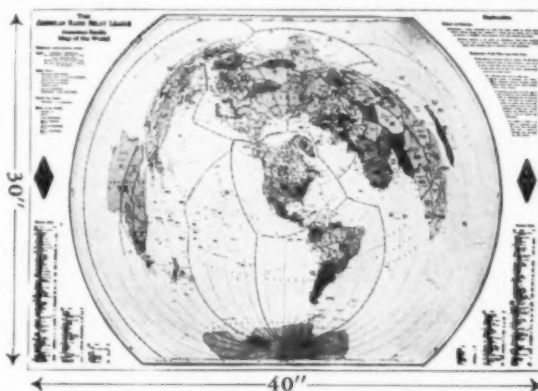
Principal cities
of the world

Divisions

Six colors
and black

Countries design-
ated by prefixes

180 prefixes in
large red letters



U. S. inspec-
tion districts
and examining
points

230 countries
indexed

2% accuracy for dis-
tance measures in
miles and kilometers

Time zones — legal
and Greenwich

PRICE
\$1.25
POSTPAID

A. R. R. L.
W. HARTFORD
CONNECTICUT

**BE Santa Claus TO YOUR
FRIENDS... COMPLETE THE
CIRCLE WITH 1938 COPIES**



QST can help you with your Christmas list. Each year an increasing number of individuals finds it to be the ideal gift. A subscription present is unique, too. It serves as a monthly reminder of your thoughtfulness. A yearly subscription, including League membership, costs only \$2.50, little enough for the ones you have in mind. And — we'll send an appropriate gift-card conveying your Christmas Greetings at the proper time.

*A Monthly Reminder of Your
Thoughtfulness and Good Judgment*

QST

38 La Salle Road West Hartford, Conn.

WE DON'T LIKE TO BRAG

but...

when 10,000 MONITOR Crystals are sold in Los Angeles in seven years... they must be good!

If you're looking for a frequency control that's made for use and abuse... that's sold at a price you can afford... do as thousands of others are doing. get a MONITOR.

*See your dealer or write
factory direct for catalog*



MONITOR PIEZO PRODUCTS CO.
2802 West Avenue 32 • Los Angeles, Calif.


A.R.R.L. QSL Bureau

FOR the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine United States and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 8 stamped envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and *your station call should be printed prominently in the upper left-hand corner.*

- W1—J. T. Steiger, W1BGY, 35 Call Street, Williamansett, Mass.
- W2—H. W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
- W3—R. E. Macomber, W3CZE, 418 10th St., N. W., Washington, D. C.
- W4—G. W. Hoke, W4DYB, 328 Mell Ave., N. E., Atlanta, Ga.
- W5—E. H. Treadaway, W5DKR, 2749 Myrtle St., New Orleans, La.
- W6—D. Cason Mast, W6KHV, 423 East E St., Ontario, Calif.
- W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.
- W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.
- W9—Roy W. McCarty, W9KA, 11 South Michigan Ave., Villa Park, Ill.
- VE1—J. E. Roue, VE1FB, 84 Spring Garden Rd., Halifax, N. S.
- VE2—C. W. Skarstedt, VE2DR, 236 Elm Ave., Westmount, P. Q.
- VE3—Bert Knowles, VE3QB, Lanark, Ont.
- VE4—George Behrends, VE4RO, 186 Oakdean Blvd., St. James, Winnipeg, Manitoba.
- VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.
- K4—F. McCown, K4RJ, Family Court 7, San-turee, Puerto Rico.
- K5—John J. Carr, K5AV, 78th Pursuit Squad-ron, Albrook Field, Canal Zone.
- K6—James F. Pa, K6LBH, 1416D Lunalilo St., Honolulu, T. H.
- K7—Leo E. Osterman, K7ENA, Customhouse, Wrangell, Alaska.
- KA—George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.

Strays

In connection with avoidance of image inter-ference with b.c. receivers (page 12, September QST) W9GDB suggests that if the receiver i.f. frequency is unknown, a freqmeter covering the 160-meter band will give a direct reading. Set the b.c. receiver to the desired station and adjust the freqmeter until a beat is heard. The calibration will indicate the operating frequency to be avoided. It may be necessary to use quite close coupling between b.c. receiver and freqmeter to get a good beat.



ALSiMAG
196 is a Low Loss
Steatite. It is Dense,
Strong, and ideally
suited for High
Frequencies.
Ask for it

"Cool as a Cucumber"

Literally True at 10 M.C.
with Coil Forms of

ALSiMAG 196

Loss Factor: 1 M.C.—.36%
10 M.C.—.23%

Are you getting ALSiMAG
196 in your apparatus?

Ask for it by name . . .

"ALSiMAG"

American Lava Corporation
Chattanooga, Tennessee

BRANCH OFFICES: Chicago, New York, Cleve-
land, Boston, St. Louis, Philadelphia, San Francisco,
Washington, D. C., Los Angeles, Toronto, Canada

(See phone book)

Leadership TRIMM Presents the TRIMM COMMERCIAL HEADSET

Like its companion, Trimm Featherweight, the Trimm Commercial is destined to become the standard by which other headsets are compared.

Especially suited to the discriminating amateur—built to more exacting requirements—provides a new high in sensitivity, service, and clarity of sound.

Write today for catalog R-4

TRIMM RADIO MANUFACTURING COMPANY
1770 W. Berteau Avenue Chicago, Illinois

110 VOLTS AC Anytime! Anywhere! With KATOLIGHT PLANTS

350 Watts AC and 6 Volts DC . . . \$ 89.60

550 Watts AC and 6 Volts DC . . . 220.00

1000 Watts AC and 10-32 Volts DC . . . 294.00

Portable—Self-Cranking

Ask for Special Discount to Amateurs

250 watt 110 v. A.C. Generator only \$19.95

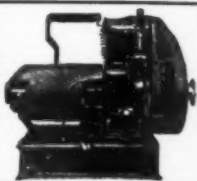
6, 12, 32 and 110 volt Rotary Converters,

AC/DC and DC Generators, etc., etc.

Write for Details

KATO ENGINEERING COMPANY

Mankatow, Minnesota, U.S.A.



R. R. Jobs for CW MEN

65 TO 80c PER HOUR. YEAR AROUND

R. R. Pension Making Hundreds of Vacancies. Learn Train
Traffic System and Morse Through our Course and Qualify
for Job in 4 Months. Time Payments if Desired. Ages 18
to 35.

CODE-CRAFT CLEVELAND, OHIO
6703-Q Dunham Ave.

READ SEND CODE LIKE AN EXPERT!

Learn Quickly at Home, Get Real Speed

It's easy, fascinating, to become a good op with the
NEW ALL ELECTRIC MASTER TELEPLEX
CODE TEACHER to help you. Only instrument ever



produced which records your
sending in visible dots and
dashes—then sends back to
you at any speed you desire.
Also sends practice work,
recorded by an expert. That
is why so many schools
teaching code prefer Master
Teleplex.

That is why thousands agree this method is surest,
quickest—has taught more ops in the past few years
than all other methods. We furnish Complete Course,
lend you Master Teleplex, give you personal instruction
with a MONEY-BACK GUARANTEE. Low cost.
Send today for booklet Q-12; no obligation.

THE "HAM" SPECIAL

Standard Teleplex—a highly efficient
code teacher using heavy specially prepared
waxed paper tape, having two rows of per-
forations. Write for Free folder QT-12.

We are the originators of this type instrument

TELEPLEX CO. 76 CORTLANDT STREET
NEW YORK, N. Y.

TELEPLEX—"The choice of those who know"

RADIO COURSES

RADIO OPERATING: Prepare for Gov't. License Exam. ●

RADIO SERVICING: Including Short Wave ● AMATEUR

CODE ● ELECTRONICS ● TELEVISION ●

Day and Evening classes—Booklet upon request

NEW YORK YMCA SCHOOLS

4 West 63rd Street, New York City

Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.



BUTLER, MISSOURI 211-215 N. Main Street
Henry Radio Shop

CHICAGO, ILL. 833 W. Jackson Blvd.
Allied Radio Corp.

CHICAGO, ILLINOIS 19 S. Wells St.
Hinds & Edgerton

CHICAGO, ILL. 901-911 W. Jackson Blvd.
Wholesale Radio Service Company, Inc.

CINCINNATI, OHIO 633 Walnut St.
Steinberg's, Inc.

COLUMBUS, OHIO 203 N. Fourth St.
Bell Radio Parts Co.

DETROIT, MICHIGAN 5027 Hamilton Ave.
Rissi Brothers, Inc.

DETROIT, MICH. 171 E. Jefferson Ave.
Radio Specialties Co.

DETROIT, MICHIGAN 11845 Woodward Ave.
Radio Specialties Co.

DULUTH, MINN. 109 E. 1st St.
Northwest Radio

KANSAS CITY, MO. 1012 McGee Street
Burstin-Applebee Company

OMAHA, NEBRASKA 2855 Farnam St.
Radio Accessories Company

ST. LOUIS, MO. 927 Pine Street
Gordon Radio Company



BUTLER, MO. 211 N. Main St.
Henry Radio Shop

CHICAGO, ILL. 833 W. Jackson Blvd.
Allied Radio Corporation

CHICAGO, ILL. 901-911 W. Jackson Blvd.
Wholesale Radio Service Company, Inc.

CHICAGO, ILLINOIS 25 North Franklin Street
Electric & Radio Supply Co., Inc.

CINCINNATI, OHIO 633 Walnut Street
Steinberg's, Inc.

CLEVELAND, OHIO 2073 West 85 Street
Northern Ohio Laboratories

CLEVELAND, OHIO 610 Huron Road
Goldhamer, Inc.

COLUMBUS, OHIO 178 N. 3rd Street
Hughes-Peters Electric Corp.

DAYTON, OHIO 140 E. 3rd Street
Burns Radio Company

DETROIT, MICH. 171 E. Jefferson Ave.
Radio Specialties Co.

Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.

FLINT, MICH.

Shand Radio Specialties

203 W. Kearsley St.

INDIANAPOLIS, IND.

Van Sickle Radio, Inc.

34 W. Ohio Street

KANSAS CITY, MO.

Burstein-Applebee Company

1012 McGee St.

MINNEAPOLIS, MINN.

Lew Bonn Co.

1124-6 Harmon Pl.

RAYTHEON
AMATEUR TUBES

CHICAGO, ILLINOIS

901-11 W. Jackson Blvd.
Wholesale Radio Service Company, Inc.

CINCINNATI, OHIO

Steinberg's, Inc.

633 Walnut Street

CLEVELAND, OHIO

2073 West 85th Street
Northern Ohio Laboratories

RME
RECEIVERS -- PRE SELECTORS
AMATEUR RADIO EQUIPMENT
RADIO MFG ENGINEERS, Inc.
PEORIA ILLINOIS

TRIPLET
INSTRUMENTS

BUTLER, MISSOURI

Henry Radio Shop

211-215 N. Main Street

CHICAGO, ILLINOIS

Hinds & Edgerton

19 South Wells Street

CINCINNATI, OHIO

North Bend Road, Mt. Airy
Jos. N. Davies

MINNEAPOLIS, MINNESOTA

Lew Bonn Company

1124-26 Harmon Place

CHICAGO, ILL.

833 W. Jackson Blvd.
Allied Radio Corporation

CHICAGO, ILL.

901-911 W. Jackson Blvd.
Wholesale Radio Service Company, Inc.

CHICAGO, ILLINOIS

25 North Franklin Street
Electric & Radio Supply Co. Inc.

CINCINNATI, OHIO

Steinberg's, Inc.

633 Walnut Street

CLEVELAND, OHIO

Goldhamer, Inc.

610 Huron Road

MINNEAPOLIS, MINN.

Lew Bonn Co.

1124-6 Harmon Pl.

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them. 123

ADD TO YOUR TRANSMITTER

with



KITS

No. 3 — \$13.95
Antenna Cou-
pling Kit
No. 4 — \$49.75
500 Watt R F
Amplifier
No. 1 — \$49.75
A complete 80
Watt C W
Transmitter
No. 2 — \$44.50
50 Watt Modu-
lator
No. 5 — \$49.75
250 Watt Class
B Modulator
Prices do not include
tubes, meters or
crystal

EASILY ADAPTED
TO YOUR LAYOUT

UTAH RADIO PRODUCTS CO.

CHICAGO, U. S. A.
TORONTO BUENOS AIRES
ONTARIO CANADA UGDA RADIO PRODUCTS CO

"16 YEARS OF LEADERSHIP"



MEMORANDUM

- ✓ You need a copy of the
new Bigger-than-ever 1938
Handbook.
- ✓ You need a binder for
your 1937 QST's — and
another for 1938.

★



Xmas suggestion — give
a membership-subscription
or a new Handbook.

DECEMBER, 1937

I. A. R. U. News

(Continued from page 50)

(phone); George W. Perdue, K6CMC (phone); Charles Boulange, ON4SS (phone); Leif Salicath, LA1G (phone); F. A. Robb, GI6TK (phone); William E. Good, W8IFD; Walter Dewars, W9TQW; Frederick S. Olsen, W2EMI; Gilbert L. Crossley, W8YA; Otis R. Dickinson, W2HTU; E. Sohler Welch, Jr., W1EVE; Clyde R. Brewer, W4RA; John G. Claiborne, W5FDI; Alan T. Margo, W6FZA; John Ginocchio, W2BDZ; Joseph H. Harms, W2JME; Robert H. Webb, W8OWB; A. James Kreider, W3FSD; Howard Gilbert, W8ANN; Leon Frederick Lavoie, K6MAW; Luis Gandia, Jr., K4BU; R. S. Woodford, VE5MZ; W. E. Marsh, SU1WM; John Lay, HB9BG; H. C. Warburton, ZT5P; G. H. Scarfe, ZU5D; M. Lelupe, ON4LU; P. R. Harvey, ZL3HK; T. E. Rowlands, ZL3JX; A. E. Smith, ZL1HH; H. J. Hunt, G5HH; G. Evans, G6YO; Albert Voituriez, F8ZZ; Artur Gersch, D4YWM; Stuart H. Gates, W9CNE; J. A. Twine, ZT6AM; Dr. J. Lynn Ironmonger, W6MLG (phone); Glen Katzenberger, W7DVY; R. H. Hoffman, W9AGO (phone); Robert E. Dawson, Jr., W4DSY (phone); Thaddeus C. Wood, Jr., W4AH (phone); Donald P. Wilkes, OA4AB (phone); Petr. Jastrzembkas, LY1J (phone); Samuel H. Luitwieler, W6GRX (phone); F. Paul Bour, FB8AB (phone); Antonio Cruz Uribe, XE1BT (phone); R. P. Walker-Alexander, VS7RA (phone); Carl Scheffy, W1ADM (phone); Carl Scheffy, W1ADM; J. M. Moyle, VK2JU (phone); A. A. Fietz, VK2QE; A. C. J. Pritchard, VK3CP; R. A. Priddle, VK2RA; H. D. Ackling, VK2PX; R. L. Belstead, VK4EI; E. H. Martin, VK3ZF; Luken Bose, VU2JN; John W. Miles, W6LEA; R. L. Perry, W6MTD; Herb. G. Schmitt, W9VZJ; Espes R. Williams, W6LIF; Charles H. Desellier, W1KID; Robert G. Wilson, Jr., W3GHD; Herbert J. Brough, W3FQG; George H. Nibbe, W9NUF; G. Herbert Smith, VE6KL; Clarence E. Vendley, W6AAE; Oscar W. B. Reed, W3FPQ; Roman Izykowski, SP1LP; John C. O'Connell, W3DAL; Wallace P. Hagestad, W7ENW; Jozef Napurko, SP1HN; A. Jeglinski, SP1CM; James Victor Stout, W3GEB; Art Cook, VE4KZ; Elmer F. Eld, W2AZB; George E. Forrest, W9ISM; E. L. Mazery, VQ8AB; José G. Garza, XE2CG; T. J. Brown, G5TB; Arthur Tibbits, VP2AT; J. MacIntosh VS1AA; C. Valkhof, PA0ALO; H. J. Beene, PA0BE; Fernand Munsch, F3AM; Christian Friedmann, D4WCT; Fritz Gorke, D3CDK; Hermann Schäfer, D3CVR; Willi Fock, D4TPJ; H. Herbert Smith, W6AZP; Charles F. Warner, W6MHH.

Strays

A slippery bug cure suggested by W9MRC: Take off the glaze with fine sandpaper, apply some glycerin and then wipe it off with a cloth. The bug will stick to any surface and will not smear or scratch the table.

TO ALL RADIO AMATEURS

GREETINGS

Another year is drawing to a close! To myself and my associates it has been a good year, and we take this means of expressing our sincere appreciation to you, our many friends, who have made it so. To all Amateur Radio we extend our best wishes for a very Merry Christmas and a Happy New Year.

W. J. Halligan



The Greetings of the Season

from your

hallicrafters dealer





NC-81X

Even in lesser details the NC-81X is outstanding. For instance, take a look at the dial above. Each of five amateur bands covers one span of the dial with extreme and uniform bandspread. Calibration is direct and an indicator inside the dial points to the proper scale. The knife-edge pointer travels over a mirror scale to eliminate parallax. Logging markers, adjustable from outside the dial case, indicate at a glance the position of most-used frequencies. The tuning knob, with automatic ratio shift, is at just the right height for easy tuning. . . . The NC-81X is notable for convenience as well as for the circuit developments that make its performance possible at such low cost.

NATIONAL COMPANY, INC.



LOOK AT THE

New RCA 809!

LOOK AT THE CONSTRUCTION

Husky electrodes, ruggedly supported in a large envelope assuring maximum heat radiation. Ceramic base and plate lead out of top for maximum insulation. Large plate cap for easy and low-loss connections.

LOOK AT THE RATINGS

	CLASS C TELEGRAPHY
D-C Plate Voltage	750 max. volts
D-C Plate Current	100 max. milliamperes
Plate Input	75 max. watts
Plate Dissipation	25 max. watts

Full input to 60 megacycles

Filament Voltage	6.3 volts
Filament Current	2.5 amperes
Amplification Factor	50

LOOK AT THE PERFORMANCE

New design provides high efficiency and low driving power at moderate plate voltages. High-mu grid means low bias requirements. Heavy duty filament and large electrodes provide for safe, conservative ratings.

LOOK AT THE PRICE

Only \$2.50 Net!

**AND THEN YOU WILL BE SATISFIED ONLY
WHEN YOU OWN A NEW RCA-809**

Your distributor has them in stock. See him or write us for full technical information.

*RCA presents the "Magic Key" every Sunday,
2 to 3 p. m., E. S. T., on NBC Blue Network*



For radio tubes in
"RCA ALL THE WAY"
in Metal—Foremost
Finest in Workmanship



for Amateur Radio

AMATEUR RADIO SECTION

RCA Manufacturing Co., Inc., Camden, N. J. • A Service of the Radio Corporation of America

